THE BRITISH CRETACEOUS PLEUROTOMARIIDAE

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By L. R. COX

CONTENTS

SYNOPSIS

A study of the British Cretaceous Pleurotomariidae has led to the recognition of at least 49 species, several of which, however, are known only as internal moulds to which it is considered specific names should not be assigned. Of the 40 named species, 28 are new, while 12 have been described by previous authors. Thirty-six of these species are included in the genera *Pleurotomaria*, *Leptomaria*, *Bathrotomaria*, and *Conotomaria*, the remainder being described under *Pleurotomaria s. lat.* The species recognized include only 8, records of which from the European continent are thought to be authentic ; many of the others seem to be of very local distribution. Pleurotomariidae are present in almost all British marine Cretaceous formations, and occur in particular variety and abundance in those referable to the Cenomanian stage.

INTRODUCTION

The only attempts hitherto made to review the British Cretaceous Gastropoda family by family are papers by Tate (1865*a*, *b*) dealing with the " Pterocerae " and " Rostellariae " and by Gardner (1875, 1876, 1877) on the Aporrhaidae, Epitoniidae [Scalidae] and Patellidae. British literature on gastropods of this age is otherwise confined to descriptions of miscellaneous species in such early works as the Sowerbys' *Mineral Conchology* and to a few scattered publications of later date, all except two or three prior to this century. The present paper is a revision of the British Cretaceous Pleurotomariidae, a family well represented in most marine formations of the period, particularly those belonging to the Cenomanian stage. Forty named species are here described, but nevertheless the revision cannot be claimed to approach finality, as several further species, including those of the Cambridge Greensand, are known only by ill-preserved specimens or internal moulds to which reliable identifications cannot be assigned. The most characteristic of the internal moulds, however, are illustrated and reference is made to the names by which they have been recorded in various species lists.

The material studied has been almost confined to the collections of the British Museum (Natural History), the Geological Survey Museum, and the Sedgwick Museum, Cambridge,[1] and I must particularly thank Messrs. S. W. Hester and A. G.

[1] In the systematic descriptions these are referred to respectively by the abbreviations " B.M." " G.S.M. " and " S.M. "

Brighton, of the second and third of these institutions, for help in the selection of material to borrow for study. Mr. C. W. Wright placed specimens of the family from his own collection at my disposal, and then very kindly presented them to the British Museum (Natural History). Dr. R. Casey, of the Geological Survey, lent me a topotype of *Leptomaria gibsi* which he had collected at Folkestone, and gave valuable assistance in identifying the matrix of various specimens from older collections. Mr. H. G. Owen, of the Department of Palaeontology of the British Museum (Natural History), helped in the same way and showed me several specimens from his own collection. Mr. C. Musgrave, of the Brighton Art Gallery and Museum, searched without success for the holotype of *Pleurotomaria jukesi* Seeley. Mr. W. Smith, of the Chelsea College of Science and Technology, gave helpful advice relating

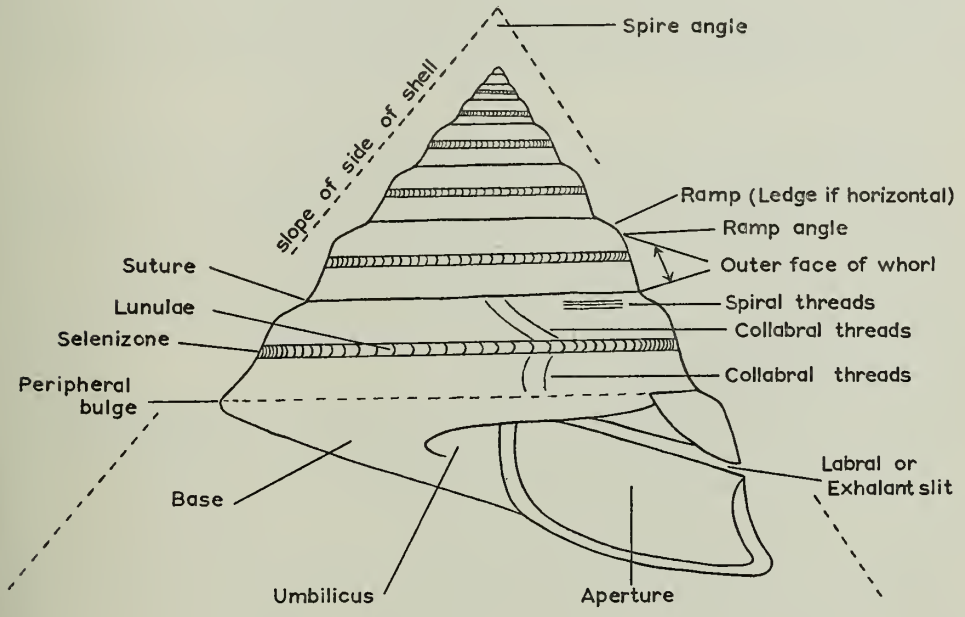

Fig. 1. Diagrammatic representation of a species of the family Pleurotomariidae, illustrating descriptive terms here employed.

to the recorded locality of the holotype of *Leptomaria hindei*, and Mr. R. L. E. Ford ascertained, by observations in the field, the exact horizons of certain species found at St. Lawrence, Isle of Wight.

The descriptive terminology here adopted is largely that introduced by J. Brookes Knight in his various papers on Palaeozoic Pleurotomariacea, as this is to be used in the section of the *Treatise on Invertebrate Palaeontology* dealing with this superfamily. It is explained by the accompanying diagram (Text-fig. 1). Specific

discrimination presented no great difficulties. The general character of the ornament, although subject to some variation, was found to be a reliable specific character and to enable such forms as *Bathrotomaria linearis* and *B. dixoni* to be distinguished from *B. perspectiva*, with which they had previously been confused. The position and nature of the selenizone were found to be very constant in the same species. The relative height of the spire is more variable in some forms, and, in the case of *B. perspectiva*, I have come to the same conclusion as previous workers that the very depressed form *B. depressa* must be regarded as one of its synonyms.

The majority of the species described belong to four well-defined groups (*Pleurotomaria*, *Leptomaria*, *Bathrotomaria*, and *Conotomaria*), which range up from the Jurassic and to which generic rank has been assigned. Two or three species, however, bear no close resemblance to any others, and are described under *Pleurotomaria sensu lato* rather than under new monotypic genera. Many of the Cretaceous Pleurotomariidae appear to have been of very local distribution and of restricted geological range. Of the species here recognized, only eight can be said definitely to occur on the European continent.

STRATIGRAPHICAL DISTRIBUTION OF SPECIES DESCRIBED

Senonian. The Upper Chalk has yielded *Bathrotomaria regalis* (Roemer) (*Belemnitella mucronata* Zone, Norwich), internal moulds of an indeterminate species, *Pleurotomaria* [*Conotomaria*?] " I " (Upper Senonian, Norwich ; *Micraster cortestudinarium* Zone, Kent) and a number of specimens, mainly internal moulds, which seem referable to *Bathrotomaria perspectiva* (Mantell) (*M. cortestudinarium* and *M. coranguinum* Zones, Kent, Sussex, Wiltshire, Yorkshire).

Turonian. The Chalk Rock, at the base of the *Holaster planus* Zone, has yielded abundant specimens of *Bathrotomaria perspectiva* (Mantell) (Hertfordshire, Bedfordshire, Buckinghamshire, Oxfordshire, Wiltshire, Hampshire). Internal moulds of the same species occur at the same horizon in Kent, Sussex, and elsewhere where the usual Chalk Rock fauna is not present, as well as at lower horizons in the Middle Chalk.

Cenomanian. Holaster subglobosus Zone of Chalk : *Bathrotomaria linearis* (Mantell) (Kent, Surrey), *B. dixoni* sp. nov. (Kent, Isle of Wight, Wiltshire), *B. velata* (Goldfuss) (Kent), *B. regalis* (Roemer) (Kent, Hertfordshire), *Pleurotomaria allobrogensis* Pictet & Roux (Kent).

Schloenbachia varians Zone of Chalk : *Pleurotomaria vectensis* sp. nov. (Kent, Isle of Wight), *P. rockenensis* sp. nov. (Isle of Wight), *Leptomaria hindei* sp. nov. (Wiltshire), *Bathrotomaria linearis* (Mantell) (Kent, Sussex, Isle of Wight, Wiltshire, Somerset), *B. dixoni* sp. nov. (Oxfordshire, Somerset, Dorset), *B. velata* (Goldfuss) (Sussex), *B. ashburneri* sp. nov. (Buckinghamshire, Sussex), *B. perspectiva* (Mantell) (Sussex, Dorset), *B. regalis* (Roemer) (Isle of Wight), *Conotomaria chardstockensis* sp. nov. (Dorset, Wiltshire), *Pleurotomaria* [*Conotomaria*?] " H " (Kent), *Pleurotomaria glyndensis* sp. nov. (Sussex).

Cenomanian Limestone of SE. Devon (not subdivided zonally) : *Leptomaria seatonensis* sp. nov., *L. axmouthensis* sp. nov., *L. wilmingtonensis* sp. nov., *L. hindei*

sp. nov. (?), *Bathrotomaria dixoni* sp. nov., *B. velata* (Goldfuss), *Conotomaria percevali* sp. nov., *C. laticarinata* sp. nov., *C. mailleana* (d'Orbigny).

Basal Cenomanian of Warminster, Wiltshire: *Pleurotomaria vectensis* sp. nov., *Leptomaria hindei* sp. nov., *Conotomaria chardstockensis* sp. nov., *C. percevali* sp. nov. (?), *Pleurotomaria* A.

Albian

Upper Albian, *Stoliczkaia dispar* Zone: *Pleurotomaria rockenensis* sp. nov. (Dorset), *P. vectensis* sp. nov. (?) (Isle of Wight), *P. allobrogensis* Pictet & Roux, *Pleurotomaria* " B "–" G " (as internal moulds in Cambridge Greensand).

Gault Clay of Folkestone: *P. plicata* (J. Sowerby) (Lower Upper and Upper Middle Albian, *Hysteroceras orbignyi* Subzone of *H. orbignyi* Zone and *Dipoloceras cristatum* Subzone of *Euhoplites lautus* Zone), *Leptomaria pricei* sp. nov. (horizon unrecorded), *Conotomaria folkestonensis* sp. nov. (horizon unrecorded).

Lower Middle Albian, *Douvilleiceras mammillatum* Zone: *Leptomaria gibsi* (J. Sowerby) (Kent, Bedfordshire).

Lower Albian, *Leymeriella regularis* Subzone of *L. tardefurcata* Zone: *Leptomaria billingtonensis* sp. nov., *Bathrotomaria leightonensis* sp. nov. (both Bedfordshire).

Lower Albian, Shenley Limestone: *P. shenleyensis* sp. nov. *Conotomaria lamplughi* sp. nov.

Aptian

Upper Aptian, Sandgate Beds, *Parahoplites nutfieldensis* Zone: *P. anstedi* Forbes (Surrey).

Upper Aptian, *Parahoplites nutfieldensis* Zone, of Seend, Wiltshire: *Conotomaria seendensis* sp. nov.

Aptian of Upware, near Cambridge: *P. campichei* Keeping.

Aptian, Hythe Beds: *P. toulmini* sp. nov. (probably Kent), *P. anstedi* Forbes (*fide* Dr. R. Casey), *Conotomaria gigantea* (J. de C. Sowerby) (Kent).

Lower Aptian of Isle of Wight: *Bathrotomaria atherfieldensis* sp. nov. (*Deshayesites forbesi* Zone), *Conotomaria gigantea* (J. de C. Sowerby) (*Tropaeum bowerbanki* Zone).

Lower Aptian of Potton, Bedfordshire: *Bathrotomaria ferruginea* (Keeping).

Neocomian

Tealby Limestone (Hauterivian): *Leptomaria donningtonensis* sp. nov., *L. willinghamensis* sp. nov.

Speeton Clay, Bed C4 (Hauterivian): *Pleurotomaria speetonensis* sp. nov. (Very imperfect fragments belonging to two or three other species have been found in the Speeton Clay at various levels.)

Lower Tealby Clay (Hauterivian): *Bathrotomaria nettletonensis* sp. nov.

Claxby Ironstone (Upper Valanginian–Hauterivian): *Bathrotomaria wrighti* sp. nov., *B. swinnertoni* sp. nov.

Spilsby Sandstone (Berriasian): *Pleurotomaria spilsbyensis* sp. nov.

SYSTEMATIC DESCRIPTIONS

Family PLEUROTOMARIIDAE

Genus *PLEUROTOMARIA* Defrance, 1826

The International Commission on Zoological Nomenclature has recently decided (Opinion 582) that this generic name should be attributed to Defrance notwithstanding its prior but unsatisfactory publication by J. Sowerby in 1821, and also that it should be validated by suppression of the name *Pleurotomarium* de Blainville, 1825.

TYPE SPECIES. *Trochus anglicus* J. Sowerby, 1818, Lias, Europe; designated by S. P. Woodward, 1851.

GENERIC CHARACTERS. Trochiform, anomphalous to broadly phaneromphalous, gradate, with outer face of whorls flattened, at least in earlier growth stages. Selenizone at mid-whorl, well below ramp angle when this is present. Ornament of sinuous spiral cords with tubercles at ramp angle and, in some species, at margin of base.

Pleurotomaria toulmini sp. nov.

(Pl. 46, fig. 5)

MATERIAL. The holotype only (B.M., G.89481, *ex* Toulmin Smith Coll.), an external mould in hard cherty limestone. The artificial cast illustrated has been prepared from this natural mould and reproduces the external characters of the original shell clearly.

DESCRIPTION. Trochiform, of large-medium size, height (*c.* 55 mm.) approximately equal to diameter, spire angle about 60°. Whorls with inclined, flattened outer face parallel to the general slope of the spire, separated by a well-marked angulation from a gently sloping sutural ramp. Base unknown. Selenizone at middle of whorl outer face, of moderate width, convex, bordered by spiral threads. Two rows of tubercles present, one at ramp angle, the second near lower suture; weak spiral cords are also present on the whole surface, overriding the tubercles.

REMARKS. I have hesitated whether to refer this specimen to *Pleurotomaria defrancei* Matheron (1843 : 237, pl. 39, fig. 14), originally described from the Neocomian of Allauch, near Marseilles, and subsequently identified by Pictet & Campiche (1863 : 416, pl. 77, fig. 2) in the Middle Neocomian of Ste Croix (Swiss Jura), and by Peron (1900 : 167, pl. 3, fig. 10) in the Neocomian of Yonne (France). All these records, however, were based on internal moulds, and, while the specimens figured by Pictet & Campiche may well have belonged to the same species as the present one, Matheron's figure represents a specimen in which the outer face of the whorls is vertical and the ramp (at least on the later whorls) is much broader than in this specimen. Only one row of tubercles is shown in Matheron's figure, although a second row is mentioned in his description.

OCCURRENCE. Aptian, Hythe Beds, probably of Kent. The locality of the speci-

men is unrecorded. Dr. R. Casey informs me its lithology agrees with that of the Hythe Beds as developed at many localities in Kent, and that internal and external moulds of shells occur commonly in this formation, although, being difficult to collect at all complete, they seldom find their way into museum collections.

Pleurotomaria campichei Keeping

(Pl. 48, figs. 1*a–c*, 2)

1883. *Pleurotomaria renevieri* Keeping, p. 98, pl. 4, figs. 1, 1*a* (*non* Pictet & Campiche, 1863).
1883. *Pleurotomaria campichei* Keeping, explan. of pl. 4, figs. 1, 1*a*.

Material. The holotype (S.M., B.19297) and one topotype (G.S.M., 96771).

Description. Small, trochiform, with the height (*c.* 20 mm.) slightly less than the diameter and the spire angle *c.* 80°. Whorls with feebly convex, sloping outer face, rounded shoulder, and narrow sutural ramp; a rather prominent, rounded peripheral bulge is present, broadly crenulated in late growth-stages and not overlapped on spire whorls. Umbilicus narrow, opening gradually into feebly convex base. Selenizone at about mid-whorl, of moderate width, slightly concave, bordered by spiral threads, and with a median spiral thread and strongly arched, closely and regularly spaced lunulae formed by raised threads. Whorl face above selenizone with about three weak spiral threads crossed by well separated, unevenly spaced collabral threads and weak collabral ribs; and between selenizone and peripheral bulge with irregular collabral threads only. Peripheral bulge and base with spiral threads most closely spaced on the bulge and absent from umbilicus; regular transverse threads are well seen in their intervals, and irregular transverse riblets appear at opening of umbilicus and continue on umbilical walls.

Remarks. As the name *P. renevieri*, under which Keeping described this species in his text, was a homonym, the name *P. campichei*, introduced, presumably by an oversight, in the explanation of his plate, is here adopted for the species.

Occurrence. Aptian of Upware, near Cambridge. Keeping stated that the species also occurs at Berklingen, Brunswick, and at Ste Croix, Swiss Jura, but gave no information about the specimens on which these records were based.

Pleurotomaria shenleyensis sp. nov.

(Pl. 48, figs. 6*a–d*)

Material. The holotype only (S.M., B.24566).

Description. Small, trochiform, with the height (14·5 mm.) just exceeding two-thirds of the diameter and the spire angle slightly obtuse. Whorls with feebly convex, sloping outer face, rounded shoulder, and narrow sutural ramp; a rather prominent, rounded peripheral bulge is present, not overlapped on spire whorls. Umbilicus narrow, rather abruptly delimited from feebly convex base. Selenizone at about mid-whorl, of moderate width, flush, bordered by spiral threads, and, where uneroded, with fairly regularly spaced, strongly arched lunulae. Whorl face above selenizone with about three weak spiral cords crossed by weak collabral

ribs ; and between selenizone and peripheral bulge with about five spiral threads crossed by collabral threads with which they form a regular cancellate pattern. Peripheral bulge and base with spiral threads most closely spaced on the bulge and absent from umbilicus ; transverse riblets appear at opening of umbilicus and continue on umbilical walls.

Remarks. This species closely resembles and was presumably descended from *P. campichei*, from which it differs mainly in its broader spire angle and its wider umbilicus, which merges less gradually into the base.

Occurrence. Lower Albian, Shenley Limestone, Shenley Hill, Bedfordshire.

Pleurotomaria plicata (J. Sowerby)

(Pl. 49, figs. 5, 6*a*, *b*, 7*a–c*)

1816. *Cirrus plicatus* J. Sowerby, p. 94, pl. 141, fig. 3.

Material. Sowerby's holotype (B.M., 43631), virtually an internal mould ; also numerous topotypes (B.M., G.S.M., and S.M.).

Description. Of small-medium size, trochiform, with the height (*c.* 35–40 mm.) usually slightly less than the diameter and the spire angle 90° or rather less. Whorls with steep, obtusely angular outer face, a rounded shoulder, and a narrow sutural ramp ; a slight peripheral bulge is present, crenulated in some specimens and not overlapped on spire whorls. Umbilicus narrow, base moderately convex. Selenizone at a mid-whorl angulation, narrow, flush, bordered by spiral threads, with feebly arched to almost straight, prosocline lunulae formed by raised threads, and in some specimens with about two weak spiral threads. Whorl face above selenizone with ten or more unevenly spaced spiral threads or cords, crossed by uneven collabral threads and, on the ramp, by broad collabral ribs ; and between selenizone and peripheral bulge with eight to ten spiral threads, crossed by irregular collabral threads forming a cancellate pattern in places. Peripheral bulge and base with spiral threads and cords, with intervals that are broadest, on the average, adaxially ; transverse threads are weak and riblets absent on the base.

Occurrence. Gault Clay of Folkestone, Kent, abundant in Price's Bed 8 (Upper Middle Albian, *Dipoloceras cristatum* Subzone of *Euhoplites lautus* Zone), rare in Bed 9 (Lower Upper Albian, *Hysteroceras orbignyi* Subzone of *H. orbignyi* Zone).

Pleurotomaria vectensis sp. nov.

(Pl. 50, figs. 8, 9, 10*a–c*)

Material. The holotype (B.M., G.3421) and one paratype (S.M., B.34838), the former retaining much and the latter a little of the shell ; also numerous internal moulds thought to belong to the same species.

Description. Of small-medium to medium size (diameter of holotype, 28·5 mm.; of largest internal mould, 58 mm.), depressed-conical, with spire angle about 40°. Whorls with almost flat outer face, sloping to conform with the general slope of the spire, a rounded shoulder, and narrow sutural ledge. Periphery sharply angular,

base flattened and impressed. Selenizone relatively wide, almost flush, at about mid-whorl well below the shoulder, bordered by spiral threads, and bearing a median spiral thread, very faint spiral striae, and rather distant, irregularly spaced, strongly arched, thread-like lunulae. Whorl face above selenizone with three spiral cords occupying the shoulder and sutural ledge, where they override transversely elongated tubercles; and between selenizone and periphery with four spiral cords crossed, on earlier whorls, by collabral threads which form a cancellate pattern with them and produce small nodes at the points of intersection. Base with irregularly spaced spiral threads which enter umbilicus and are most closely arranged near the periphery, but without transverse ornament.

Remarks. An imperfect specimen (B.M., G.81302) from the Upper Greensand (Upper Albian) of St. Lawrence, collected by Mr. R. L. E. Ford, differs from the holotype in the presence of transverse riblets at the umbilical opening and in the fewer spiral cords on its base. It may prove to belong to a distinct although related species.

Occurrence. A possible representative in the Upper Albian, Upper Greensand, of St. Lawrence, Isle of Wight. Lower Cenomanian, *Schloenbachia varians* Zone, Glauconitic Marl, of Sand Rock Spring, near Chale (type locality), Compton Bay, St. Catherine's Point, and St. Lawrence, all Isle of Wight. Lower Cenomanian of Warminster, Wiltshire. Cenomanian (Lower Chalk) of Lewes and Eastbourne, Sussex, and of Folkestone, Kent.

Pleurotomaria rockenensis sp. nov.

(Pl. 51, figs. 2*a–c*, 3, 4*a*, *b*)

Material. The holotype (B.M., G.89490, C. W. Wright Coll.), two paratypes retaining portions of their shell, and several internal moulds assumed to belong to the same species.

Description. Of small-medium size, very depressed, with the diameter (*c.* 40 mm. in the largest specimen) well exceeding twice the height and the spire angle 110° or more, the proportions varying to some extent. Whorls with a sloping, almost flat outer face, a well-marked shoulder, and a subhorizontal sutural shelf; a rounded peripheral bulge is present. Base feebly convex and low, the aperture being very broad in proportion to its height. Umbilicus relatively narrow. Selenizone below whorl shoulder, moderately wide, almost flush, bordered on each side by a spiral thread, and bearing faint spiral striae and weak, well-arched, thread-like lunulae. Ornament consisting of a row of conspicuous rounded tubercles on the sutural shelf, two faintly nodose spiral threads between the selenizone and peripheral bulge, small transversely elongated nodes crossed by spiral cords on the peripheral bulge, and numerous unequal spiral cords, some obscurely nodose, on the base.

Remarks. This may be the species recorded (Jukes-Browne & Hill, 1904 : 473) as *P. moreausiana* d'Orbigny, the original figures of which (d'Orbigny, 1843, pl. 199, figs. 3–6) represent, however, a shell with a very sharply carinate periphery.

Occurrence. Lower Cenomanian (Glauconitic Marl) of Rocken End (type

locality), St. Catherine's Point, Sand Rock Spring, near Chale, and Ventnor; all Isle of Wight. Uppermost Albian (*Stoliczkaia dispar* Zone), Holworth House cliffs, South Dorset.

Genus *LEPTOMARIA* E. Eudes-Deslongchamps, 1864

TYPE SPECIES. *Pleurotomaria amoena* J. A. Eudes-Deslongchamps, Bajocian, France; by original designation.

GENERIC CHARACTERS. Conical or cyrtoconoid, anomphalous to broadly phaneromphalous; whorls weakly to strongly convex, not angular, the last rounded at periphery of convex base; selenizone at mid-whorl; ornament of spiral threads cancellated in some species by collabral threads.

Leptomaria donningtonensis sp. nov.

(Pl. 46, figs. 3, 4)

MATERIAL. The holotype (S.M., B.11676); a second specimen (S.M., B.11677) is considered to be a crushed representative of the species.

DESCRIPTION. Of medium size, turbiniform, the diameter (43 mm.) slightly exceeding the height in the holotype; if, however, the almost planispiral coiling of the early whorls and consequent apical truncation are due to compression, the original height must have been approximately equal to the diameter. Whorls strongly convex, the last evenly rounded at margin of moderately convex base. No umbilicus. Selenizone at or slightly above mid-whorl, rather broad, convex, with well-separated, prominent lunulae (seen in B.11677). Whorl face bearing above selenizone four to five spiral cords crossed by weak collabral riblets, and between selenizone and lower suture about five nodose spiral cords; base with numerous spiral cords with narrow intervals.

OCCURRENCE. Hauterivian, Tealby Limestone, Donnington, Lincolnshire (type-locality). The specimen B.11677 is from the same formation at North Willingham, Lincolnshire.

Leptomaria willinghamensis sp. nov.

(Pl. 46, figs. *7a*, *b*)

MATERIAL. The holotype only (S.M., B.11675).

DESCRIPTION. Of small-medium size, trochiform, with the height (originally *c.* 22 mm.) slightly less than the diameter and the spire angle approximately a right angle. Whorls with a narrow sutural shelf, below which they are feebly and evenly convex; periphery sharply carinate. No umbilicus. Selenizone a rather narrow projecting cord just below mid-whorl. Whorl face both above and below selenizone bearing fine collabral riblets forming a cancellate pattern with weaker, narrow, rather numerous spiral cords. Ornament of base unknown.

REMARKS. The ornament is coarser than in *L. billingtonensis* and there is no umbilicus.

OCCURRENCE. Hauterivian, Tealby Limestone, North Willingham, Lincolnshire.

Leptomaria billingtonensis sp. nov.

(Pl. 48, figs. *7a–d*)

Material. The holotype (B.M., G.65274) and one paratype (G.61263).

Description. Of small-medium size, turbiniform, diameter (*c.* 25 mm.) very slightly exceeding height ; spire angle slightly less than a right angle. Whorls evenly and rather strongly convex, periphery broadly rounded. Base convex, with narrow umbilicus. Selenizone at mid-whorl, narrow, flat, almost flush, bordered on each side by a faint spiral groove and bearing close-spaced, feebly arched lunulae and obscure spiral threads. Whorl face, both above and below selenizone, ornamented with numerous spiral and collabral threads, forming a cancellate pattern. Ornament of base imperfectly known, apparently of a similar type.

Remarks. The actual surface of the shell, showing the ornament, is preserved only on small portions of the holotype. Otherwise, the specimens retain at the most only the inner layers of the shell. Its greater height readily distinguishes this species from *L. gibsi* and *L. pricei*.

Occurrence. Lower Albian, *Leymeriella regularis* Subzone of *L. tardefurcata* Zone, Arnold's (formerly Pratt's) Pit, Billington Crossing, near Leighton Buzzard, Bedfordshire.

Leptomaria gibsi (J. Sowerby)

(Pl. 49, figs. 1, 2*a*, *b*, 3)

1821. *Trochus gibsi* J. Sowerby, p. 139, pl. 278, fig. 1.
1843. ? *Pleurotomaria gurgitis* (Brongn.) : d'Orbigny, p. 249, pl. 192, figs. 4–6 (*non* Brongniart sp.).

Material. Holotype (B.M., 43630). Topotypes, similarly preserved, in the same and in the Geological Survey Museums (R. Casey Coll.). Several specimens from other localities, as stated below.

Description. Of small-medium size, trochiform, with height (*c.* 17 mm. in the holotype) about four-fifths of the diameter and the spire angle slightly exceeding 90°. Whorls feebly and evenly convex, the last subcarinate at periphery. Base feebly convex, with narrow umbilicus. Selenizone moderately wide, at mid-whorl, flush, between narrow spiral grooves and with a narrow median groove. Whorl face, above and below selenizone, with fine spiral and collabral threads forming a delicate cancellate pattern ; ornament of base unknown.

Remarks. The holotype (Pl. 49, figs. 2*a*, *b*) is a phosphatized specimen in which the outer shell layer has disappeared, leaving an inner layer which is smooth except for faint spiral striations and growth-lines best seen on the base. Dr. R. Casey has collected topotypes which are similarly preserved except that in one (Pl. 49, fig. 3) a small area of the original surface remains and shows the delicate cancellate ornament described above. An impression of the ornament of most of the upper surface of the shell (Pl. 49, fig. 1) is preserved on an external mould (B.M., G.55140) from near Leighton Buzzard, and a specimen from Borough Green (G.S.M., Zm 1075)

retains a small patch of shell showing the selenizone and surface ornament, which agree well with the impression preserved on the external mould just mentioned.

The French Albian specimens figured by d'Orbigny (1843) as *Pleurotomaria gurgitis* may have belonged to *L. gibsi* and are quite distinct from the taller form to which the name *Trochus gurgitis* was originally given by Brongniart, and which Pictet & Roux (1849 : 223) thought might be Sowerby's *Solarium conoideum*. A shell from the Cenomanian of Syria figured as *L. gibbsi* by Delpey (1939 : 61, text-figs. 37, 38) differs in the distinct median angulation of its whorls.

Occurrence. Lower Middle Albian, Lower Gault, main *Douvilleiceras mammillatum* Zone, of Folkestone (type locality) ; *D. mammillatum* Zone of Borough Green, Wrotham, and Bearsted, Kent, and of Gatehouse Pit, Grovebury, Leighton Buzzard, Bedfordshire.

Leptomaria pricei sp. nov.

(Pl. 49, figs. 8*a–c*)

Specific name. Named after F. G. H. Price, who in 1874 described the Gault succession at Folkestone.

Material. The holotype (S.M., B.31837) ; also several paratypes (mostly B.M.).

Description. Of small-medium size, low-turbiniform, with the diameter (36 mm. in the holotype) four-thirds of the height and the spire angle about 120°. Whorls strongly and evenly convex, their surface curving round to become horizontal where it meets the suture ; last whorl carinate at periphery. Base rather strongly convex ; umbilicus moderately wide. Selenizone a narrow, smooth, strongly convex cord at mid-whorl. Whorl face, both above and below selenizone, with narrow, unequal, closely spaced spiral threads and cords which bear small nodes where crossed by somewhat irregular, weak collabral threads ; on the last whorl of the holotype there are about ten spirals above the selenizone and eighteen below it. Base with numerous more or less nodose spiral cords which are most closely spaced near the periphery.

Remarks. The much stronger convexity of the whorls and the narrow selenizone readily distinguish this species from *Leptomaria gibsi*. The less distinctly shouldered whorls, the absence of definite ribs near the suture, and the narrowness and prominence of the selenizone distinguish it from *Pleurotomaria plicata*, which occurs in a similar matrix of Gault Clay.

Occurrence. Albian, Gault Clay (exact bed unrecorded), Folkestone, Kent.

Leptomaria seatonensis sp. nov.

(Pl. 54, figs. 1*a*, *b*, 2)

Material. The holotype (B.M., G.89493, C. W. Wright Coll.) ; also two paratypes (B.M.).

Description. Of medium size (diameter of largest specimen 47 mm.), broadly conical, the diameter only slightly exceeding the height. Whorls strongly and evenly convex. Base convex ; umbilicus of moderate width. Selenizone at mid-whorl,

broad, flush, smooth or with faint spiral grooves crossed by the faint lunulae. Whorl face ornamented with numerous unequal spiral threads crossed near the upper suture, most conspicuously on the earlier whorls, by weak collabral riblets. Base with unevenly spaced concentric grooves.

Remarks. *Leptomaria royana* (d'Orbigny), Cenomanian of France, is the most closely comparable species of approximately the same geological age described from other areas, but the details of its ornament are unknown.

Occurrence. Cenomanian Limestone of Havencliff, ¾ mile E. of Seaton, Devon (Bed B of Jukes-Browne).

Leptomaria axmouthensis sp. nov.

(Pl. 52, figs. 4*a*, *b*, 5*a*, *b*)

Material. The holotype (S.M., B.34824) and one paratype (S.M.).

Description. Of medium size (diameter of larger specimen 46 mm.), low-turbiniform, with obtuse, cyrtoconoid spire and strongly and evenly convex whorls abutting simply at the sutures. Height of aperture slightly less than that of spire. No peripheral bulge. Base strongly convex; umbilicus wide. Selenizone slightly above mid-whorl, narrow, flat, with closely and unevenly spaced lunulae. Whorl face with rather unevenly arranged spiral threads and cords, rendered obscurely granose, particularly on the earlier whorls, by closely spaced collabral threads. Similar ornament occupies the outer part of the base, but is replaced towards the umbilicus by flat bands varying in width.

Remarks. The relatively higher spire, the broader umbilicus, and the absence of a peripheral bulge distinguish this species from *Leptomaria hindei*.

Occurrence. Cenomanian Limestone of Axmouth, E. of Seaton, Devon (Beds 11 and 12 of Mayer).

Leptomaria wilmingtonensis sp. nov.

(Pl. 51, figs. 5, 6*a*, *b*)

Material. The holotype (B.M., G. 89495) and two paratypes (B.M.).

Description. Of medium size (diameter of largest specimen 44 mm.), depressed-conical, with obtuse, slightly cyrtoconoid spire and flat to feebly convex whorls separated by narrowly channelled sutures. Height of aperture about one-half of that of spire. A slight peripheral bulge, not completely overlapped on the spire whorls, is present. Base feebly convex; umbilicus very narrow. Selenizone broad, flush, at mid-whorl. Face of whorls ornamented with unequal spiral cords (largely obliterated by erosion in the available specimens), and, near the upper suture, with transversely elongated tubercles which apparently die out on the last whorl. Base smooth except for growth-rugae and (in one specimen) obscure spiral threads around the umbilicus.

Remarks. The very narrow umbilicus and the flatter whorls readily distinguish this species from *L. axmouthensis* and *L. hindei*.

Occurrence. Cenomanian Limestone of Wilmington, near Honiton, Devon.

Leptomaria hindei sp. nov.

(Pl. 51, figs. 1*a–c*)

Material. The holotype (B.M., G.27577, G. J. Hinde Coll.) and two paratypes (G.S.M., 96767–8).

Description. Medium-sized (diameter of largest specimen *c.* 70 mm.), low-turbiniform, with obtuse, cyrtoconoid, dome-like spire and strongly and evenly convex whorls separated by a channelled suture. Last whorl relatively high, with a very slight, angular peripheral bulge. Base strongly convex, umbilicus moderately wide. Selenizone at mid-whorl, details of its structure unknown. Whorl face with numerous narrow, slightly unequal spiral threads and cords. Similar ornament occupies the outer part of the base, but is replaced towards the umbilicus by more distant, shallow spiral grooves. Transverse ornament almost confined to broad, coarse rugae at umbilical margin.

Remarks. Two specimens from Devizes seem to be those recorded in the Lower and Middle Chalk Memoir (Jukes-Browne & Hill, 1903 : 163) as *Pleurotomaria brongniartiana* d'Orbigny, but they differ from that species, as figured by d'Orbigny (1843, pl. 203, figs. 1–4) in their more dome-like spire and less angular periphery. They are, perhaps, more closely comparable to that author's (1843, pl. 203, figs. 5, 6) *P. royana*, founded, however, on an internal mould.

Occurrence. Cenomanian, probably of South Devon, and of Devizes, Wiltshire. (The locality of the holotype was recorded as " Shalford " on the collector's original label, retained with the specimen, but could not have been Shalford, near Guildford, so that it seems possible that the label was misplaced. The matrix is exactly like that of specimens from the Cenomanian Limestone of Devon.) A somewhat doubtful specimen (S.M.) is from the Cenomanian of Warminster, Wiltshire.

Genus *BATHROTOMARIA* Cox, 1956

Type species. *Trochus reticulatus* J. Sowerby, Upper Jurassic ; by original designation.

Generic characters. Trochiform, elevated to depressed, anomphalous to broadly phaneromphalous ; whorls (at least in earlier growth-stages) angulate, with usually broad ramp ; a second carina or angulation, just overlapped on spire, delimiting base ; selenizone at ramp angle ; ornament of spiral threads commonly cancellated by collabral threads.

Bathrotomaria wrighti sp. nov.

(Pl. 45, figs. 4*a–d*)

Material. The holotype only (B.M., G.89484, C. W. Wright Coll.).

Description. Of medium size, depressed-trochiform, with the diameter (50 mm.) well exceeding the height (32 mm.). Whorls obtusely angular, with the ramp gently sloping and feebly convex, and about equal in width to the moderately steep whorl

outer face. A slight peripheral bulge is present. Base of moderate convexity; umbilicus broad. Details of selenizone unobservable. Whorl face ornamented everywhere with moderately strong spiral threads and bearing narrow collabral riblets on the part of the ramp near the suture. Base unornamented, umbilical walls with narrow transverse riblets.

Remarks. No closely comparable species of Lower Cretaceous age has been described previously. *B. linearis* (Mantell), from the Cenomanian, has more numerous and finer spiral threads.

Occurrence. Neocomian, Hauterivian, Claxby Ironstone, Nettleton Top Mine, Lincolnshire.

Bathrotomaria swinnertoni sp. nov.

(Pl. 45, figs. 2*a*, *b*, 3)

Specific name. Named after Professor H. H. Swinnerton in recognition of his work on English Neocomian palaeontology.

Material. The holotype (B.M., G.89485) and one paratype (G.89486), both C. W. Wright Coll.

Description. Small, trochiform, with the height (10 mm. in the paratype) slightly less than the diameter (11·2 mm.) and the spire angle slightly less than 90°. Whorls obtusely angular, with the outer face flat and sloping and the ramp broad, flat, and inclined to the horizontal at an angle of about 45°. Periphery rounded, bulging slightly in places. Base feebly convex; no umbilicus. Selenizone a projecting cord of moderate width at ramp angle, bearing equidistant, slightly arched, filiform or even stronger lunulae. Entire surface, including base, ornamented with spiral threads of unequal strength with broader intervals, and with evenly spaced growth-threads, forming a delicate cancellate pattern; there are about five to eight spirals on the ramp and seven on the whorl outer face.

Occurrence. Neocomian, Hauterivian, Claxby Ironstone, Nettleton Top Mine, Lincolnshire.

Bathrotomaria nettletonensis sp. nov.

(Pl. 46, figs. 1*a–c*)

Material. The holotype only (B.M., G.89487, C. W. Wright Coll.).

Description. Of medium size, depressed-turbiniform, with the height (27 mm.) about three-fifths of the diameter, and a dome-like spire. Whorls with a feebly convex, rather steeply sloping outer face and a broad, feebly convex, very gently inclined ramp. Periphery broadly convex, without bulge. Base rather strongly convex, umbilicus wide. Selenizone at ramp angle, moderately wide, strongly convex, the details of its ornament not preserved. Ramp, whorl outer face and outer part of base bearing spiral cords of unequal width; these are crossed, on peripheral region only, by weak collabral riblets. Remainder of base smooth.

Remarks. This species is distinguished from *B. wrighti* by its more depressed spire, the strongly convex selenizone, and the coarser spiral ornament. It is not a

very typical *Bathrotomaria*, but agrees better with that genus than with *Leptomaria*.

Occurrence. Neocomian, Hauterivian, Lower Tealby Clay, Nettleton Top Mine, Lincolnshire.

Bathrotomaria speetonensis sp. nov.

(Pl. 45, figs. 5, 6*a*, *b*)

1878. *Trochus complicatus* Forbes MS. : E. T. Newton, p. 22 (*nom. nud.*).

Material. The holotype (B.M., G.55232) and two paratypes (G.S.M., 96772–3).

Description. Of small-medium size (diameter *c.* 38 mm.), trochiform, height probably about equal to diameter (early whorls are missing in available specimens). Whorls with a flat or feebly convex, steep outer face, separated by a well-marked angulation from a broad, very gently sloping, feebly convex sutural ramp. Periphery angular, base flattened-convex, no umbilicus. Selenizone of moderate width, strongly convex, at ramp angle. Ramp ornamented with twelve or more weak spiral threads and with weak collabral threads confined to the neighbourhood of the suture ; outer face of whorls with up to about twelve spiral threads or cords, which are weakest and most closely spaced near the selenizone and are crossed by collabral rugae.

Occurrence. Neocomian, Hauterivian, Bed C4, Speeton, Yorkshire.

Bathrotomaria atherfieldensis sp. nov.

(Pl. 46, figs. 2*a*, *b*)

Material. The holotype only (B.M., G.432).

Description. Small, trochiform, diameter (*c.* 26 mm.) slightly exceeding height, spire angle about 90°. Whorls obtusely angular, with steep outer face and broad ramp forming an angle of 30°–40° with the horizontal. Periphery rounded, base feebly convex ; no umbilicus. Selenizone a moderately broad, strongly convex, almost smooth cord at ramp angle. Ramp and whorl outer face bearing rounded spiral cords with linear intervals, subordinate collabral rugae, and close-spaced collabral threads visible in places in the intervals ; there are about nine spiral cords on the ramp and seven on the outer face. Base ornamented with rounded spiral cords near periphery and with broader, flat bands of unequal width on its inner part, together with subordinate transverse threads and rugae, as on whorl face.

Occurrence. Lower Aptian, *Deshayesites forbesi* Zone, Lower Lobster Bed (top of Atherfield Clay), Atherfield, Isle of Wight.

Bathrotomaria ferruginea (Keeping)

Pl. 46, fig. 6

1883. *Pleurotomaria ferruginea* Keeping, p. 99, pl. 4, figs. 2*a*, *b*.

Material. The holotype (S.M., B.19304) and one topotype (B.M., 66365).

Description. Moderately large, conical, diameter (up to 93 mm.) slightly less

than height, spire angle about 60°. Whorls very obtusely angular, the last with a slight bulge at its subangular periphery. Base rather flattened, umbilicus very narrow. Selenizone, at whorl angulation, a very narrow, smooth cord between two linear grooves. Whorl face ornamented with numerous unequal and unevenly spaced linear grooves, with subordinate growth-rugae and, in places only, collabral threads forming a cancellate pattern with the spirals. Base unornamented except near the periphery, where faint, close-spaced linear grooves occur.

Occurrence. Lower Aptian, Potton, Bedfordshire.

Bathrotomaria leightonensis sp. nov.

(Pl. 48, figs. 3*a*, *b*, 4)

Material. The holotype (B.M., G.89488) and one paratype, an external mould (G.89489), both C. W. Wright Coll. Three specimens in the Sedgwick Museum (B.58436–8), internal moulds or virtually so, probably belong to this species.

Description. Of small-medium size, depressed-trochiform, height (*c.* 17 mm. in the holotype) three-quarters of the diameter or more ; spire angle from about 90°–110°. Whorls obtusely angular, with steep, almost vertical outer face and a broad, flattened ramp inclined to the horizontal at an angle of about 40° ; periphery with a slight subangular bulge. Base feebly convex, umbilicus probably absent. Selenizone, at ramp angle, of moderate width, flush, bearing three longitudinal threads and well-arched, thread-like lunulae. Surface, including base, ornamented with spiral threads crossed by fairly evenly and closely spaced collabral threads, forming a cancellate pattern ; the spiral threads number about nine on the ramp and eight on the outer face, and they are closely arranged on the base.

Remarks. In this species the spiral ornament is more delicate and the collabral threads are better developed than in *B. atherfieldensis*.

Occurrence. Lower Albian, *Leymeriella regularis* Subzone, Arnold's Pit, Billington Crossing, near Leighton Buzzard, Bedfordshire.

Bathrotomaria linearis (Mantell)

(Pl. 55, figs. 3*a–c*, 4)

1822. *Trochus linearis* Mantell, p 110, pl. 18, figs. 16, 17.
1840. *Trochus linearis* Mant.: Geinitz, p. 46, pl. 13, figs. 6 (?), 8*a*, *b* ; pl. 15, figs. 18 (?), 19 (?).
1889. *Pleurotomaria linearis* Mant.: Fritsch, p. 74, text-fig. 48.
1898. *Pleurotomaria plana* Münst.: Müller, p. 85, pl. 12, figs. 3, 4 (*non* Münster).

Material. Mantell's two syntypes (B.M. 8628, 8639), the second of which (8639, Mantell's fig. 17, Pl. 55, figs. 3*a–c* of the present paper) is selected as lectotype. Also numerous other specimens, some doubtfully identified owing to imperfect preservation.

Description. Of medium to large-medium size (diameter of largest specimens *c.* 100 mm.), depressed-conical, with the diameter about twice the height and the spire angle about 100° in the lectotype. Whorls very obtusely angular, with sloping

outer face and well inclined ramp which is as wide as the outer face or even slightly wider. Last whorl subangular and with a slight bulge at periphery. Base flattened-convex, umbilicus moderately broad. Selenizone a smooth, convex cord of moderate width at whorl angulation. Ornament of outer face and ramp consisting of spiral threads or cords, of which those on the ramp are obscurely nodose or cancellated by fine collabral threads in early growth stages. Base with concentric riblets and threads which mostly alternate in strength.

Remarks. Unfortunately all the available specimens, including the syntypes, are indifferently preserved, but the distinctive characters of the species are easily recognizable. The subangular periphery with its slight bulge distinguishes *B. linearis* from full-grown specimens of *B. perspectiva*, the broader ramp, narrower selenizone, and absence of transverse riblets from *B. dixoni*. I refer to *B. linearis* the specimen from the Lower Senonian of Germany figured by Müller as *Pleurotomaria plana*, but the true Upper Senonian *P. plana*, which Holzapfel (1888, pl. 20, figs. 5*a*, *b*) has figured, is more depressed, with rounded rather than angular whorls.

Occurrence. Cenomanian, *Schloenbachia varians* Zone, of Hamsey, near Lewes, Sussex (type locality) and of various localities in Kent, Sussex, the Isle of Wight, Wiltshire and Somerset. It would appear from the references to Fritsch and Müller cited above that on the European continent the range of the species extends up into the Turonian and Lower Senonian.

Bathrotomaria dixoni sp. nov.

(Pl. 55, figs. 1*a–c*, 2)

1844. ? *Pleurotomaria distincta* Dujard. : Goldfuss, p 75, pl. 187, figs. 1*a–c* (*non* Dujardin).
1850. *Pleurotomaria perspectiva* Mant. : J. de C. Sowerby, *in* Dixon, p. 349, pl. 27, fig. 27 (*non* Mantell sp.).

Material. The holotype (B.M., G.49848) and several paratypes (B.M., S.M.).

Description. Of medium size (maximum diameter *c.* 50 mm.), depressed-turbiniform, with the height about two-thirds of the diameter and the spire angle about 90°. Whorls obtusely angular, with gently sloping outer face and narrower, still more gently sloping ramp. Periphery with a slight, abruptly rounded bulge. Base feebly convex, umbilicus moderately broad. Selenizone, situated at ramp angle rather high on whorl, a relatively wide, convex cord which is smooth except for two or three very faint spiral grooves or threads. Ramp bearing collabral riblets which extend from the suture to more than half-way to ramp angle and are crossed by delicate spiral threads. Whorl outer face and base with numerous fine spiral threads, crossed in places by transverse threads which form a cancellate pattern with, and may produce small granules on, them. At the margin of the umbilicus and on its walls the transverse threads are strengthened and coalesce to form riblets.

Remarks. The relatively wide, strongly convex selenizone, the narrower ramp, and the transverse riblets on it readily distinguish this species from *B. linearis*. The more sharply rounded periphery, which persists in the full-grown shell, distinguishes it from *B. perspectiva*.

Occurrence. Cenomanian, *Holaster subglobosus* Zone of Chalk, Kent, Isle of

Wight, Wiltshire ; *Schloenbachia varians* Zone of Chalk, Oxfordshire, Somerset, Dorset ; Cenomanian limestone of SE. Devon (type locality, Culverhole).

Bathrotomaria velata (Goldfuss)

(Pl. 54, figs. 3*a–c*, 4)

1844. *Pleurotomaria velata* Goldfuss, p. 76, pl. 187, figs. 2*a–c*.

Material. Several specimens (B.M., S.M.).

Description. Attaining a fairly large size (diameter of largest specimen *c.* 85 mm.), depressed-turbiniform, with the diameter about twice the height and the spire angle about 120°. Ramp angle obtuse or slightly rounded off, whorl outer face gently sloping, ramp very gently sloping to subhorizontal. Periphery with subangular bulge. Base convex ; umbilicus wide. Selenizone a very narrow, convex, transversely ridged cord between two linear grooves at ramp angle ; the narrow labral slit to which it corresponds can be seen in some specimens extending back about a third of a whorl from the aperture. Whorl outer face and ramp ornamented with very small granules at the intersections of very narrow, closely arranged spiral cords and collabral threads. Base with numerous narrow spiral cords which are strongly granose near the periphery but only weakly so towards the umbilical opening, where they alternate with narrower threads.

Remarks. The relatively small specimens from the Cenomanian of Devon, such as the one illustrated in Pl. 54, figs. 3*a–c*, show the undistorted shape of the shell and the delicate sculpture in an uneroded condition. Specimens from the Lower Chalk, such as the one represented in Pl. 54, fig. 4, are larger but distorted ; their sculpture agrees well with that of the smaller specimens. These British specimens appear to agree with the description and figure of the species given by Goldfuss, but, if this interpretation of *B. velata* is correct, the species cannot be identical with the higher and more distinctly graduate form, *B. regalis* (Roemer), as suggested by Wollemann (1903 : 83).

Occurrence. Cenomanian, *Holaster subglobosus* Zone, Kent ; *Schloenbachia varians* Zone, Sussex ; Cenomanian Limestone of SE. Devon.

Bathrotomaria ashburneri sp. nov.

(Pl. 56)

Material. The holotype (B.M., G.78106, collected by Mr. M. Ashburner) and one paratype (S.M., B.34807).

Description. Moderately large, broadly conical, with the diameter (*c.* 96 mm. in the holotype) exceeding the height and the spire angle slightly less than 90°. Whorls with a very obtuse angulation relatively high on their side, separating a flat or slightly concave outer face from a narrow, rather steeply sloping ramp. Last whorl sharply angular and bulging at periphery. Base flattened-convex, umbilicus broad. Selenizone at ramp angle, moderately wide, concave, bearing very feebly arched, irregularly arranged, thread-like lunulae. Suture bordered on each side by

a weak, beaded spiral cord and not readily distinguished. Ornament of remainder of whorl face consisting of numerous fine, closely spaced, unequal spiral threads, crossed by closely spaced collabral threads. Small granules are present at many of the intersections, but there is no regular cancellate pattern. Base ornamented with unequal, weak spiral cords and threads.

Remarks. The holotype and paratype agree well in the details of the ornament and in the position and characters of the selenizone. The fineness and irregularity of the ornament are very characteristic. In *B. velata* the ornament is more regular, the selenizone narrower, convex, and further from the suture, and the base more strongly convex.

Occurrence. Cenomanian, *Schloenbachia varians* Zone, Lower Chalk, of Chinnor, Buckinghamshire (type locality) and of " Sussex ".

Bathrotomaria perspectiva (Mantell)

(Pl. 58, figs. 1*a–c*, 2, 3*a*, *b* ; Pl. 59, figs. 1*a–c*, 2, 3 ; Pl. 60, fig. 2)

1822. *Cirrus perspectivus* Mantell, p. 194, pl. 18, figs. 12, 21.
1822. *Cirrus depressus* Mantell, p. 195, pl. 18, figs. 18, 22.
1822. *Cirrus granulatus* Mantell, p. 195.
1823. *Cirrus perspectivus* J. de C. Sowerby, p. 35, pl. 428, figs. 1, 2.
1823. *Cirrus depressus* J. de C. Sowerby, p. 35, pl. 428, fig. 3.
1833. *Cirrus perspectivus* Mantell, p. 124, text-figs. *b*, *c*.
1833. *Cirrus depressus* Mantell, p. 124, text-fig. *a*.
1843. *Pleurotomaria perspectiva* Sowerby : d'Orbigny, p. 255, pl. 196.
1844. *Pleurotomaria seriato-granulata* Goldfuss, p. 75, pl. 186, figs. 10*a*, *b*.
1844. *Pleurotomaria granulifera* Münster [MS.] : Goldfuss, p. 76, pl. 187, figs. 3*a*, *b*.
1889. *Pleurotomaria perspectiva* Mant. : Fritsch, p. 74, text-fig. 49.
1896. *Pleurotomaria* (*Leptomaria*) *perspectiva* (Mantell) : Woods, p. 186, pl. 3, figs. 13, 14 ; pl. 4, fig. 1.
1898. *Pleurotomaria granulifera* Münst. : Müller, p. 86, pl. 11, figs. 10–13.

Material. Syntype of *Cirrus perspectivus* represented in Mantell's fig. 21, and now designated as lectotype, B.M., G.19057 ; other syntype (Mantell's fig. 12) not traced. Syntype of *Cirrus depressus* represented in Mantell's fig. 18, and now designated as lectotype of that nominal species, B.M., 8622 : other syntype (Mantell's fig. 22) not traced. Holotype of *Cirrus granulatus* (not previously figured), B.M., G.60538. Sowerby's figured specimens of *C. perspectivus*, B.M., G.89524–5, and of *C. depressus*, B.M., 43611. Woods' figured specimens (S.M., B.4273–5). Numerous other specimens.

Description. Of medium size, highly variable in relative height, the most elevated specimens trochiform, with the height about three-quarters of the diameter, the most depressed specimens (Mantell's *Cirrus depressus*) subdiscoidal except for the protruding early whorls. The diameter of the largest shell-bearing specimens referred to the species is 80 mm., but that of a still larger cast retaining the ornament is 104 mm. Earlier whorls obtusely angular, later ones with a strongly convex outline, the evenness of which is modified to a varying extent by the moderately

wide, strongly convex, cord-like selenizone, which lies well above mid-whorl and is separated from the suture by a gently inclined, moderately broad ramp, varying from slightly concave to slightly convex. Last whorl usually strongly and evenly convex at periphery in full-grown specimens; in earlier growth-stages, however, the periphery may be more angular and a peripheral bulge present. Base convex; umbilicus moderately wide. Selenizone, at least in earlier growth-stages, bearing distinct granules as well as arched, thread-like lunulae. Ramp and whorl outer face ornamented on later whorls (in most specimens) with narrow spiral grooves crossed by collabral grooves, so that the whole surface is cut up into small, lozenge-shaped areas. On the earlier whorls these areas are represented by small granules, the ornament consisting of granose spiral threads, and in occasional specimens the later whorls also have ornament of this type. Base ornamented with concentric cords of unequal strength, most closely spaced near the periphery; in earlier growth-stages these cords are granose.

Remarks. The lectotype of *Cirrus perspectivus* is an internal mould, but the strong and even convexity of its last whorl has convinced me of its specific identity with the larger shell-bearing specimens upon which the above description has been based, rather than with any other Chalk species here described. Mantell's holotype of *Cirrus granulatus*, previously unfigured, is illustrated in Pl. 16, fig. 3. In the Sedgwick Museum is a large series of specimens from the Chalk Rock of Cuckhamsley, Berkshire, showing successive stages in growth in which the changes in outline and ornament from shells of the *granulatus* type to those like the one illustrated in Pl. 58, figs. 3*a*, *b* (itself from the Cenomanian) can be followed. The same shells vary greatly in the height of the spire and confirm the conclusion of previous authors that Mantell's *Cirrus depressus* was merely a very depressed individual of the same species as his *C. perspectivus*. The ornament of the later whorls of these depressed shells agrees exactly with that of the corresponding whorls of the most elevated specimens. Their depressed form is not due to deformation in fossilization, as they mostly come from the Chalk Rock, in which the fossils have usually suffered no compression. The nodose selenizone is observable in all the smaller specimens, but the nodes are at the best very obscure in full-grown specimens, possibly owing to erosion. Müller commented on their presence in German specimens referred to *Pleurotomaria granulifera*, the original figure of which much resembles the smaller and similarly ornamented English specimens. Variability in whorl outline among specimens agreeing in the elevation of the spire is shown by shells from the Chalk Rock of Aston Hill, SE. of Aston Rowant, Oxfordshire, and Cuckhamsley, Berkshire. In those from the former locality (Pl. 60, fig. 2) the whorl ramp is distinctly concave, whereas in those from Cuckhamsley (Pl. 58, figs. 3*a*. *b*) it is feebly convex.

Among internal moulds from the Senonian Chalk which most probably belong to *B. perspectiva* are some in which the subangular periphery characteristic of earlier growth stages of Chalk Rock specimens persists in relatively late growth-stages, up to a diameter of 65 mm. in the case of a specimen (B.M., G.79134) from the *Micraster cortestudinarium* Zone of Wiltshire. In the specimen from Bohemia, upon which the species *Pleurotomaria seriatogranulata* Goldfuss was founded, the angular whorl outline and peripheral bulge appear similarly to have persisted to

a later growth-stage than in English Turonian specimens, but I consider that this form should be regarded as a synonym of *B. perspectiva*.

The angularity of the whorl outline, although usually confined to the earlier whorls, justifies the inclusion of this species in *Bathrotomaria* rather than in *Leptomaria*. It differs from *B. dixoni* in its broader sutural ramp and in the absence of transverse riblets on the ramp.

Occurrence. Upper Albian (top of Upper Greensand), Weymouth (doubtful specimen). Cenomanian Limestone, Seaton, Devon. Cenomanian (Lower Chalk) of Lewes, Sussex (type locality of *Cirrus granulatus*) and Bridport, Dorset. Turonian (especially Chalk Rock or equivalent horizon) of Kent, Sussex, Berkshire, Wiltshire, Hertfordshire, Oxfordshire, and Bedfordshire. Lower Senonian (*Micraster cortestudinarium* and *M. coranguinum* Zones) of Kent, Sussex, Wiltshire, and Yorkshire (mainly internal moulds).

Bathrotomaria regalis (Roemer)

(Pl. 57, figs. 1*a–c*, 3)

1841. *Trochus regalis* Roemer, p. 81, pl. 12, fig. 7.
1889. *Pleurotomaria regalis* (Roemer) : Griepenkerl, p. 71.
1898. *Pleurotomaria regalis* (Roem.) : Müller, p. 85, pl. 11, figs. 7, 8.
1903. *Pleurotomaria regalis* (Roemer) : Wollemann, p. 83, pl. 3, fig. 8.
1921. *Pleurotomaria regalis* (Roem.) : Ravn, p. 30, fig. 5.

Material. Several specimens (B.M., S.M., G.S.M.).

Description. Moderately large, gradate-conical, diameter of largest specimen (*c.* 80 mm.) approximately equal to its original height, although some specimens are more depressed. Whorls with vertical or almost vertical, flat to slightly concave outer face separated by a well-marked angulation from a wide, gently sloping ramp. Last whorl subangular at periphery. Base moderately convex, umbilicus narrow. Selenizone at ramp angle, convex, relatively narrow. Ornament consisting of numerous spiral threads and cords which, on the best preserved specimen, can be seen to be crossed by fine, close-set collabral grooves, producing small granulations on the cords.

Remarks. Griepenkerl and Müller have included *Pleurotomaria velata* Goldfuss in the synonymy of this species, but the form here identified as *Bathrotomaria velata* is much more depressed and broadly umbilicate, with a gently inclined whorl outer face, while the spiral element of its ornament is not predominant, as in the present specimens.

Occurrence. Lower Cenomanian, *Schloenbachia varians* Zone, of St. Lawrence, Isle of Wight. Upper Cenomanian, *Holaster subglobosus* Zone, of Folkestone and Dover (Grey Chalk) and of Wendover Canal, near Little Tring, Hertfordshire. Upper Senonian, *Belemnitella mucronata* Zone, Norwich. Roemer stated that the type specimen of *Trochus regalis* came from the " untere Kreide ". Müller, however, recorded the species from the Lower Senonian, and Griepenkerl, Wollemann and Ravn from the Upper Senonian.

Genus *CONOTOMARIA* Cox, 1959

TYPE SPECIES. *Pleurotomaria mailleana* d'Orbigny, 1843.

GENERIC CHARACTERS. Conical, anomphalous to broadly phenerомphalous; whorls flat or slightly sigmoidal in outline, last whorl with sharply angular, often bulging periphery; selenizone at or above mid-whorl, quite close to suture in some species, not coinciding with an angulation; predominant ornament spiral cords.

Conotomaria gigantea (J. de C. Sowerby)

1836. *Pleurotomaria striata* Fitton, p. 153; also explan. of pl. 14, fig. 16.
1836. *Pleurotomaria gigantea* J. de C. Sowerby, p. 339, pl. 14, fig. 16.
1850. *Pleurotomaria fittoni* d'Orbigny, p. 70 (new name for *P. striata* Fitton, considered a secondary homonym of *Helix striata* J. Sowerby (*non* Roemer)).
1858. *Pleurotomaria gigantea* Sow.: Pictet & Renevier, p. 38, pl. 4, fig. 5.
1900. *Pleurotomaria gigantea* Sow.: Wollemann, p. 148.

MATERIAL. Numerous specimens. The holotype has not been traced.

DESCRIPTION. Large (diameter up to about 165 mm.), conical; mostly with diameter slightly less than height and spire angle about 70°; some specimens, however, are more depressed, possibly owing to deformation in fossilization. Whorls flat or almost so, the last with sharply angular, scarcely bulging periphery and flattened or concave base; no umbilicus. Selenizone relatively narrow, slightly above mid-whorl, its detailed structure unknown. Whorl face and base ornamented with numerous unequal spiral bands and depressed cords; there may be as many as twenty on the whorl face below the selenizone, the number above the latter being smaller. Collabral ornament apparently confined to growth-rugae, although no specimens have been seen with the finer ornamental details preserved.

REMARKS. There appears to have been some indecision regarding the name under which this species was to be described. Of the two specific names originally published, *gigantea* is the one that has been generally adopted.

OCCURRENCE. Aptian, Hythe Beds, of Kent. Lower Aptian, Ferruginous Sands, *Tropaeum bowerbanki* Zone, of Isle of Wight. Records of the species from Switzerland and Germany seem reliable.

Conotomaria seendensis sp. nov.

(Pl. 47, figs. 2*a–d*)

MATERIAL. The holotype (G.S.M., 44656); also two specimens (G.S.M., 44657–8) too imperfect to rank as paratypes.

DESCRIPTION. Small, regularly conical, diameter (*c.* 18·5 mm. in holotype) only slightly exceeding height, spire angle rather less than 90°. Whorls flat, the last abruptly rounded at periphery, which has a slight bulge. Base flattened, not well exposed; umbilicus probably absent. Selenizone at mid-whorl, flush, of moderate

width, its detailed structure not preserved. Ornament of spiral cords, about eight on whorl face below selenizone and six above it, overridden by weaker, evenly and closely spaced collabral threads.

Occurrence. Upper Aptian, *Parahoplites nutfieldensis* Zone, Seend, Wiltshire.

Conotomaria lamplughi sp. nov.

(Pl. 48, figs. 5*a–c*)

Material. The holotype (S.M., B.24567) and one paratype (B.M., G.89503, C. W. Wright Coll.).

Description. Small, regularly conical, diameter (*c.* 24 mm. in paratype, the larger specimen) almost equal to height, spire angle about 70°. Whorls flat, the last abruptly rounded at periphery, which has a pronounced bulge not overlapped on the penultimate whorl. Base flattened; no umbilicus. Selenizone at mid-whorl, of moderate width, flush, with a median and bordering threads, but without pronounced lunulae. Whorl face ornamented with spiral threads (four of primary strength above selenizone and about ten below it, with weaker intercalaries on last whorl), crossed by rather unevenly spaced collabral threads, which produce a fine cancellate pattern and small nodes on the spirals, particularly above selenizone. Base with similar cancellate ornament.

Remarks. This species much resembles *C. seendensis*, but has a more acute apex, a less pronounced peripheral bulge and (apparently) a somewhat more coarsely cancellate ornament.

Occurrence. Lower Albian, Shenley Limestone, Shenley Hill, Bedfordshire.

Conotomaria folkestonensis sp. nov.

(Pl. 49, figs. 4*a*, *b*)

Material. The holotype only (B.M., G.89482).

Description. Of small-medium size, conical, with the diameter (*c.* 30 mm.) probably exceeding the height (the lower part of the shell is obscured by matrix) and the spire angle slightly more than 90°. Whorls with a flat outer face inclined in conformity with the general slope of the spire and a very narrow, subhorizontal or gently inclined sutural ledge or ramp. Selenizone at ramp angle, very high on whorl side, convex, with weak tubercles. Whorl outer face bearing numerous fine spiral threads; sutural ledge with about six rather coarser threads. Collabral ornament, of delicate threads, is confined to the sutural ramp and to the lower part of the outer face.

Remarks. The presence of a distinct ramp angle is unusual in *Conotomaria*, but the conical form of the shell and the high position of the selenizone suggest that it is with this genus that the species has closest affinity.

Occurrence. Albian, Gault Clay (bed uncertain) of Folkestone, Kent.

Conotomaria chardstockensis sp. nov.

(Pl. 50, figs. 11, 12*a–c*)

Material. The holotype (B.M., G.3422), a specimen lacking the apical whorls but retaining the original shell on most of the last whorl, and several internal moulds assumed to belong to the same species.

Description. Of small-medium size, high-conical, the height (*c.* 33 mm. in the largest specimen) considerably exceeding the diameter and the spire angle about 50°. Whorls almost flat, the last sharply rounded at periphery, with flattened base; no umbilicus. Selenizone narrow, impressed, almost at mid-whorl. Whorl face with about seven flattened spiral cords below selenizone, but smooth above it except for a low, broad swelling adjoining the suture. Base with numerous spiral cords.

Remarks. The internal mould of *Pleurotomaria thurmanni* Pictet & Roux (1849 : 230, pl. 22, fig. 1), Albian of Switzerland, is rather similar in shape, but the shell is very differently ornamented. *P. fleuriausa* d'Orbigny (1843 : 265, pl. 201, figs. 5, 6), Cenomanian of France, has whorls which are sigmoidal in outline and bear spiral cords above as well as below the selenizone.

Occurrence. Cenomanian of Chardstock, Dorset (type-locality), and of Warminster, Maiden Bradley, and Devizes, Wiltshire.

Conotomaria percevali sp. nov.

(Pl. 57, figs. 2*a*, *b*)

Material. The holotype (B.M., G.23029, presented by S. G. Perceval, Esq.) and one paratype (B.M., G.89504, C. W. Wright Coll.). Also two internal moulds, possibly referable to the species.

Description. Moderately large, conical, with the height (originally *c.* 80 mm. in the largest specimen, the paratype) almost equal to the diameter and the spire angle slightly exceeding 60°. Whorls quite flat except in the paratype, in which the last whorl tends to develop an ill-defined shoulder near the aperture. Last whorl subangular at periphery. Base very feebly convex; umbilicus narrow. Selenizone high on whorl side, one-fifth to one-quarter of breadth of whorl from upper suture, narrow, flush, between spiral threads, and separated from suture by a smooth band. Whorl face below selenizone bearing four broad, flat spiral bands with narrower intervals each occupied by a spiral thread. Base ornamented with only slightly unequal spiral bands with narrow, relatively deep intervals.

Remarks. *Pleurotomaria marrotiana* d'Orbigny (1843 : 267, pl. 202, figs. 5, 6) was based on an internal mould of a *Conotomaria* much resembling the present species in shape and size, but as its selenizone and surface ornament have not been described it is uncertain if it is a closely related form. The high position of the selenizone is very characteristic of the present species.

Occurrence. Cenomanian Limestone " near Axmouth, Devon " (type-locality)

and Whitlands, Devon (probably the same bed, queried by C. W. Wright as " top of Bed A " [of Jukes-Browne], and possibly almost the same locality). Internal moulds, possibly of this species, from the Cenomanian of Sidmouth, Devon and of Warminster, Wiltshire.

Conotomaria mailleana (d'Orbigny)

(Pl. 52, figs. 1*a–c*, 2)

1843. *Pleurotomaria mailleana* d'Orbigny, p. 253, pl. 195.
1867. *Pleurotomaria mailleana* d'Orb. : Guéranger, p. 10, pl. 12, unnumbered fig.; pl. 13, fig. 1.

Material. Five specimens (B.M.), two fairly complete.

Description. Of medium size, depressed-conical, diameter (80 mm. in largest specimen) slightly less than twice the height, spire angle *c.* 110°. Whorl outline sigmoidal, convex above, concave below ; periphery angular, bulging to a moderate extent. Base moderately to strongly convex ; umbilicus broad. Selenizone rather high on whorl face, where whorl outline changes from convex to concave, its detailed structure not preserved in the specimens now recorded. Whorl face ornamented with fine spiral grooves (clearly preserved in present material only on a small part of surface of one specimen) ; base with concentric cords and threads which mostly alternate in strength.

Remarks. The specimens agree well with the figures of French Cenomanian specimens cited above. This species bears a slight resemblance to *Bathrotomaria linearis* (Mantell), the most obvious differences lying in the position of its selenizone, which is at mid-whorl in that species, and in its more angular and bulging periphery. *Pleurotomaria supercretacea* Favre (1869 : 51, pl. 8, figs 17*a–c*) from Galicia seems a closely related species.

Occurrence. Cenomanian Limestone, Seaton, Devon. Cenomanian basement bed, Snowdon Hill, Chard, Somerset. The species is also recorded from Warminster and the Isle of Wight by the Geological Survey (Jukes-Browne & Hill, 1900 : 463 ; 1904 : 473), but I have seen no specimens from these localities.

Conotomaria laticarinata sp. nov.

(Pl. 53, figs. 1*a–c*)

Material. The holotype only (B.M., G.89505, C. W. Wright Coll.).

Description. Rather large, the diameter (originally *c.* 110 mm. in the holotype) much exceeding the height, and the spire broadly conical, with an angle of about 110°. Whorls sigmoidal in outline, with the greater part of their face rather strongly concave, the convex part narrow, forming a sutural ledge. Periphery with a very broad, attenuated keel. Base strongly convex, umbilicus wide. Selenizone at edge of sutural ledge, very close to suture, and consisting of a moderately convex median cord separated by grooves from narrow lateral cords. Outer face of whorls ornamented with numerous fine grooves, separating spiral threads which are crossed by very weak, opisthocline collabral threads. Base ornamented with shallow spiral

grooves which are closely arranged near the periphery and more distant near the umbilical opening ; weak spiral cords are present on the umbilical walls.

Remarks. This species seems related to *Conotomaria mailleana* (d'Orbigny), described above, and to *C. formosa* (Leymerie) (d'Orbigny, 1843 : 259, pl. 199, figs. 1, 2), differing from both in the close proximity of its selenizone to the suture, its broader peripheral keel, and its more strongly convex base.

Occurrence. Cenomanian Limestone (probably top of Bed A of Jukes-Browne), Whitlands, near Seaton, Devon.

Genus ***PLEUROTOMARIA*** Defrance, 1826 (*sensu lato*)

The following species of Pleurotomariidae do not agree with any of the genera (*Pleurotomaria, Leptomaria, Bathrotomaria, Conotomaria*) to which the species described above belong, but it has not been thought desirable to found further genera for their reception. They are, therefore, referred to *Pleurotomaria, sensu lato.*

Pleurotomaria spilsbyensis sp. nov.

(Pl. 44 ; Pl. 45, fig. 1)

Material. The holotype (B.M., G.4351) and one paratype (S.M., B.11696).

Description. Large (diameter of holotype 117 mm.), depressed-turbiniform, with low, obtuse spire. Last whorl with a steep, flattened-convex outer face not sharply separated from a broad, gently sloping, convex upper face. Periphery broadly rounded ; base strongly convex ; umbilicus broad, open, bordered by an obtuse angulation. Selenizone high on outer face of whorls, very wide, strongly concave, with deep, parabolic lunulae. Adjoining the slightly channelled suture, and bordered on its outer side by a shallow groove, is a broad, ill-defined spiral swelling crossed by short, obscure collabral ribs. No other spiral ornament is visible except an ill-defined cord which is just exposed above the suture near the aperture and forms the margin of the base. Collabral rugae conspicuous and irregular ; they form the only ornament on the base.

Occurrence. Neocomian, Berriasian, Spilsby Sandstone, Lincolnshire. The locality of the holotype, collected by J. E. Lee, is not recorded, but its matrix is identical with that of the paratype, which comes from Donnington.

Pleurotomaria anstedi Forbes

(Pl. 47, figs. 1*a–d*)

1845. *Pleurotomaria anstedi* Forbes, p. 349, pl. 5, fig. 1.

Material. The holotype (G.S.M., 2235) and a few other specimens.

Description. Moderately large (diameter up to 80 mm.), depressed-turbiniform, with a low, dome-like spire in which the early whorls have an almost discoidal

coiling ; height of shell slightly less than two-thirds of diameter. Face of whorls evenly and strongly convex ; periphery with a not very prominent, cord-like bulge, which remains exposed on the later spire whorls. Base moderately convex ; umbilicus broad, bordered by an ill-defined, obtuse ridge. Selenizone wide, strongly convex, situated well above mid-whorl, and bearing irregular, well-arched lunulae. Ornament consisting of numerous irregular spiral threads and cords which may undulate unevenly and are absent from the base. No collabral ornament except irregular rugae.

Remarks. This appears to be a species of very local distribution, and records from other countries seem to be based on misidentifications. Thus a specimen from the Lower Cretaceous of the Swiss Jura figured as *P. anstedi* by Pictet & Campiche (1863, pl. 80, fig. 3) is wrongly named, as is also, most probably, an internal mould from the Neocomian of Germany figured by Weerth (1884, pl. 7, fig. 12).

Occurrence. Upper Aptian, Sandgate Beds, *Parahoplites nutfieldensis* Zone, Fuller's Earth, of Nutfield, Surrey (type locality) and of Redhill, Surrey. Dr. R. Casey tells me that the species occurs also in the Hythe Beds, although there are no specimens from this formation in the collections examined.

Pleurotomaria allobrogensis Pictet & Roux

(Pl. 50, figs. 1*a*, *b*)

1849. *Pleurotomaria allobrogensis* Pictet & Roux, p. 240, pl. 23, fig. 3.

Material. Several specimens (B.M., S.M.).

Description. Obtusely conical internal moulds of medium size (diameter *c.* 45 mm.) in which the feebly convex whorls are encircled by three strong, rounded spiral cords, the last corresponding to the peripheral bulge of the last whorl. The selenizone appears to have been located on the middle one of these cords. In the specimens now recorded the uppermost cord fades away on the last whorl and does not reach the aperture.

Remarks. This species was founded on internal moulds from the Albian Greensand of the Geneva district. Although the ornament of the actual shell is still undescribed, the species (unlike most) can be readily recognized from its internal mould, and I refer the specimens now recorded to it without hesitation. It has already been cited in Cambridge Greensand species lists.

Occurrence. Uppermost Albian, Cambridge Greensand, of the Cambridge district. Upper Cenomanian, Grey Chalk, Dover (B.M.).

Pleurotomaria glyndensis sp. nov.

(Pl. 53, figs. 2*a–c*)

Material. The holotype only (B.M., 88804).

Description. Of small-medium size (diameter of holotype 30 mm., but part of

last whorl is broken away), sublenticular, with low, obtuse spire. Whorls with flattened outer face, a rounded shoulder, and a very narrow, subhorizontal sutural ramp. Periphery rounded, base moderately convex; umbilicus rather narrow. Selenizone at mid-whorl, well below shoulder, narrow, almost flush, slightly nodose, distinguishable only with difficulty between the tuberculate spiral cords (three above it, four on whorl face below it) that constitute the ornament. Base with a relatively small number of tuberculate spiral cords which, except near the periphery, are regularly spaced and separated by intervals of greater width; a weak spiral cord occupies the middle of some of the intervals.

Remarks. This shell is more coarsely granose than specimens of *Bathrotomaria perspectiva* of comparable size, and differs in the position of its selenizone, well below the ramp angle. Compared with *P. galliennei* d'Orbigny (1843 : 256, pl. 197), from the French Cenomanian, it differs in that its granules are smaller and not transversely aligned, and in the ornament of its base.

Occurrence. Cenomanian, *Schloenbachia varians* Zone, Lower Chalk, of Glynde, near Lewes, Sussex.

Species Represented Only by Internal Moulds to which Specific Names are Not Assigned

Pleurotomaria A

(Pl. 52, fig. 3)

Material. Several specimens (B.M.).

Description. Broadly conical moulds of medium size (maximum diameter 45 mm.) in which the diameter much exceeds the height and the whorls and periphery are of very strong and even convexity.

Remarks. These specimens agree well with *P. laharpi* Pictet & Campiche (1863 : 437, pl. 80, fig. 5), founded on similar internal moulds from the Upper Gault of Switzerland.

Occurrence. Cenomanian, Upper Greensand, Warminster, Wiltshire.

Pleurotomaria B

(Pl. 50, fig. 3)

Material. Several specimens (B.M., S.M.).

Description. Coeloconoid moulds of medium size (maximum diameter 41 mm.), in which the diameter only slightly exceeds the height, the convexity of the whorls is very slight, and the periphery is angular. A sutural ledge appears on the last whorl.

Remarks. These specimens were the basis of Jukes-Browne's (1875 : 308) record of *P. laharpi* from the Cambridge Greensand, but they differ from that species in their coeloconoid spire, flatter whorls and angular periphery. They are more like *P. vectensis*, sp. nov., but in that species the spire is lower and not coeloconoid.

Occurrence. Upper Albian, Cambridge Greensand.

Pleurotomaria C

(Pl. 50, fig. 4)

MATERIAL. Several specimens (S.M., B.M.).

DESCRIPTION. Broadly conical, trochiform moulds of large-medium size in which the diameter (60 mm. in the largest specimens) well exceeds the height and the whorls have a steeply sloping outer face, a rounded shoulder, and a narrow sutural ledge. The periphery is subangular.

REMARKS. Seeley (1861 : 294) listed specimens of this species as *P. neocomiensis* d'Orbigny, and Jukes-Browne (1875 : 293, 308) as *P. vraconensis* Pictet & Campiche (1863 : 443, pl. 81, fig. 3). Specimens listed by Jukes-Browne (1875 : 308) as *P. jukesii* Seeley (see p. 419) do not appear to be separable from them. In the true *P. vraconensis*, from the Upper Gault of Switzerland, the outer face of the whorls is steeper, the sutural shelf wider and the periphery less angular. The present specimens seem closer to *P. plicata* (J. Sowerby) (see p. 394) but are larger and rather more depressed than that species.

OCCURRENCE. Upper Albian, Cambridge Greensand.

Pleurotomaria D

(Pl. 50, fig. 2)

MATERIAL. Several specimens (B.M., S.M.).

DESCRIPTION. Sublenticular, depressed moulds of medium size (maximum diameter 40 mm.), in which the whorls have a flattened-convex outer face inclined at an angle of about 60° with the horizontal, a narrow sutural ledge, and subangular periphery.

REMARKS. Specimens of this species in the Sedgwick Museum were recorded by Jukes-Browne (1875 : 294, 308) under the name *P. rouxi* d'Orbigny (1850 : 132). D'Orbigny erected the species in question for the unfigured form misidentified by Pictet & Roux (1849 : 244) as *P. fittoni* Roemer (1841 : 82, pl. 12, fig. 10). As the only published figures of *P. rouxi*, those of Renevier (1868, pl. 6, figs. 10, 11), are of imperfect specimens and are of little help in the identification of the species, it is not obvious how Jukes-Browne identified English specimens with it. The internal moulds now described closely resemble the one figured by Pictet & Campiche (1863 : 440, pl. 81, figs. 2*a–c*) under the name *P. moreausiana* d'Orbigny, although this seems to have been quite distinct from d'Orbigny's species.

OCCURRENCE. Upper Albian, Cambridge Greensand.

Pleurotomaria E

(Pl. 50, fig. 6)

MATERIAL. Several specimens (B.M., S.M.).

DESCRIPTION. Depressed-turbiniform moulds of small-medium size (maximum diameter 32 mm.) in which the diameter is about twice the height and the sloping

whorl face is strongly convex, with a narrow sutural ledge. The periphery is rather abruptly rounded.

Remarks. This form was listed by Jukes-Browne (1875 : 294, 308) as *P. rhodani* (Brongniart). The figures of that species published by Brongniart (1822 : 96, pl. 9, fig. 8) and by Pictet & Roux (1849, pl. 24, fig. 1) are of a *Leptomaria* with strongly and evenly convex whorls, from the Albian of the Perte du Rhône, near Bellegarde. D'Orbigny (1843, pl. 192, figs. 7, 8) figured under the same name an internal mould with more numerous whorls than Brongniart's species. The present internal moulds could conceivably belong to the true *P. rhodani*, but their identity cannot be established definitely.

Occurrence. Upper Albian, Cambridge Greensand.

Pleurotomaria F

(Pl. 50, fig. 5)

Material. Several specimens (B.M., S.M.).

Description. Depressed-cyrtoconoid, almost lenticular moulds of large-medium size (maximum diameter 62 mm.), with the face of the whorls feebly convex and inclined to the horizontal at an angle of about 50°. Periphery angular.

Remarks. This form was listed by Seeley (1861 : 294) as *P. brongniartiana* ? d'Orbigny and by Jukes-Browne (1875 : 308) as *P. lima* d'Orbigny (1843 : 248, pl. 192, figs. 1–3). The outline of the internal mould is rather like d'Orbigny's fig. 3 (except that the peripheral bulge is less distinct), but the largest of d'Orbigny's specimens is only 33 mm. in diameter. It is most probable, therefore, that the present species is distinct from *P. lima*. There is also a rather close resemblance to the internal mould upon which d'Orbigny (1843 : 271, pl. 205, figs. 1, 2) founded the species *P. espaillaciana*, but the periphery of the present form is not quite so sharp as in that specimen.

Occurrence. Upper Albian, Cambridge Greensand.

Pleurotomaria G

(Pl. 50, fig. 7)

Material. Four specimens (B.M.).

Description. Trochiform moulds of medium size (maximum diameter 41 mm.) in which the diameter is somewhat in excess of the height and the whorls have a steeply sloping, only slightly convex face on which two spiral swellings, one quite close to the suture, are visible. The periphery is subangular.

Remarks. These moulds differ from those recorded above as " *Pleurotomaria* C " in the narrowness of their sutural ledge (which was probably absent on the original shell), in their slightly greater height, and in the presence of the two spiral swellings. They are more elevated than in *P. allobrogensis*, in which two comparable swellings are present.

Occurrence. Upper Albian, Cambridge Greensand.

Pleurotomaria [*Conotomaria*?] H

(Pl. 60, fig. 3)

Material. One specimen (B.M., G.16517).

Description. A large, conical internal mould lacking the apical whorls. Its original height (*c.* 140 mm.) was well in excess of the diameter (*c.* 110 mm.) and its spire angle is about 45°. The whorls are almost flat-sided and are subangular at the periphery, the later ones imbricating slightly. There are obscure indications of a selenizone situated at mid-whorl.

Remarks. This specimen is probably a *Conotomaria*, but the position of the selenizone shows that it does not belong to *C. percevali*. It could belong to *C. marrotiana* (d'Orbigny) (1843 : 267, pl. 202, figs. 5, 6), which was, however, founded on a much smaller internal mould without imbricating whorls. The position of the selenizone in *C. marrotiana* is, moreover, uncertain, and the type-specimen of the species seems to have come from beds of Senonian age.

Occurrence. Cenomanian, Newington, near Folkestone, Kent.

Pleurotomaria [*Conotomaria* ?] I

(Pl. 60, figs. 1*a*, *b*)

Material. Three specimens (B.M.).

Description. Trochiform internal moulds, the largest about 105 mm. in diameter, in which the diameter somewhat exceeds the height, the outer face of the whorls is flat or slightly concave and very steep, and there is a narrow, almost horizontal sutural ledge. The periphery is subangular.

Preserved with the internal mould here figured is an oyster valve found associated with it by A. W. Rowe, its collector. Although the exact position which it occupied cannot be ascertained, this valve evidently grew attached to the last whorl of the gastropod by almost its entire surface and, while the gastropod shell has now disappeared by solution in the course of fossilization, the attachment area of the oyster reproduces its ornament in negative very clearly (Pl. 60, fig. 1*b*). The selenizone, with the growth-lines sweeping back to it, is seen to have been high on the feebly convex, unangulated whorl side, and to have been bordered above and below by almost smooth bands. The lower half of the whorl side is occupied by closely spaced spiral cords separated by intervals of about their own width, while four spiral ridges near the upper edge of the oyster (which presumably coincided with the position of the suture) represent grooves on the original shell.

Remarks. The more elevated of the internal moulds now recorded are very similar to the much smaller specimen figured by Müller (1898, pl. 11, fig. 9) as *Pleurotomaria subgigantea* d'Orbigny. The figure of Goldfuss (1844, pl. 187, figs. 6*a–c*) upon which d'Orbigny's species was founded represents a *Conotomaria* in which the selenizone is lower on the whorl side than in the form now described (according to the evidence of the oyster valve) and the spiral cords are weaker. The form now

described was almost certainly also a *Conotomaria*, the sutural shelf present on the internal mould resulting, presumably, from a relatively thick shell, as the oyster valve gives no indication of its presence on the exterior of the actual shell.

Occurrence. Senonian, *Micraster cortestudinarium* Zone, of Kent. Upper Senonian of Norwich, Norfolk.

SPECIES NOT ACCEPTED, OR TRANSFERRED TO OTHER FAMILIES

Trochus bicarinatus J. Sowerby

1818. *Trochus bicarinatus* J. Sowerby, p. 39, pl. 221, fig. 2.
1840. *Pleurotomaria bicarinata* J. de C. Sowerby, Index, p. 10.

Sowerby stated that the holotype (B.M., 43638) came from Marcham Field, Oxfordshire, a well-known locality for Corallian fossils. It appears to be wrongly localized, as its matrix contains grains of glauconite and is probably Upper Greensand. The species, referred to *Pleurotomaria*, is recorded with a query from the "Chloritic Marl" of Maiden Bradley in the catalogue of the Geological Survey Collection (E. T. Newton, 1878 : 74). There is no trace of a selenizone on the small amount of shell retained by the holotype, and I think that the species belongs to the group of Cretaceous forms which Cossmann (1916 : 140) includes in the genus *Nummocalcar*.

Pleurotomaria jukesii Seeley

1864. *Pleurotomaria jukesii* Seeley, p. 92, pl. 8, figs. 10, 11.

This species was founded on a specimen in the Brighton Museum from the Chalk of an unrecorded locality. Its description was illustrated by two crude line drawings, and it was said to be distinguishable from *P. perspectiva* (Mantell) by its few whorls. The holotype, evidently a *Bathrotomaria*, cannot now be traced in the collection of the Brighton Museum, and the identity of the species, if distinct from *P. perspectiva*, is not obvious. The species must, therefore, of necessity be ignored. Internal moulds from the Cambridge Greensand which Jukes-Browne (1875 : 308) identified as *P. jukesii* are here (p. 416) recorded as "*Pleurotomaria* C".

Trochus laevis Pulteney

1813. *Trochus laevis* Pulteney, p. 108, fig. 11 of pl.
1940. *Pleurotomaria laevis* (Pulteney) : Cox, p. 126, pl. 7, fig. 11.

This species was founded on an internal mould from the Upper Greensand of Melbury, near Shaftesbury, Dorset. The type specimen cannot now be traced, but clearly closely resembled internal moulds of *Bathrotomaria perspectiva*, the earliest occurrence of which here recorded (with some doubt) is in the Upper Greensand of Weymouth. Pulteney's name *laevis* remains available should future collecting show that the Upper Greensand form is distinct from *B. perspectiva*. It would, however, be undesirable for it to replace the name *perspectiva* if they prove to be identical.

Pleurotomaria semiconcava Seeley

1861. *Pleurotomaria semiconcava* Seeley, p. 291, pl. 11, fig. 17.

This species (holotype, S.M., B.38726) was founded on a small internal mould from the Cambridge Greensand. I can observe no trace of a selenizone, although Seeley's description mentions a " keel of the sinus ". The specimen most probably belongs to the genus *Semisolarium*.

Pleurotomaria thomsoni Tate

1843. *Turbo? bicarinatus* Sowerby MS. : Portlock, p. 421 (four prior homonyms already existed).
1865. *Pleurotomaria thomsoni* Tate, p. 37.

The holotype (G.S.M., 52447) is a littoriniform internal mould retaining small portions of the inner layers of the shell. There is no trace of a selenizone and the shape of the specimen is unlike that of any pleurotomariid. Woods (1896 : 89) records having examined it and come to the conclusion that it is the internal mould of a shell related to his species *Turbo geinitzi*. I fully agree with his remarks. The specimen came from the Upper Chalk of Co. Derry, Northern Ireland.

UNCONFIRMED OR REJECTED RECORDS

(Queried or qualified identifications have been omitted, and only the most important published lists of species have been examined.)

brongniartiana d'Orbigny. Record : Chloritic Marl of North Wiltshire (Jukes-Browne & Hill, 1903 : 163 ; also 1904 : 473, queried from several areas). The Wiltshire record may refer to *Leptomaria hindei* sp. nov. (p. 400).

cassisiana d'Orbigny. Records : Cenomanian of Dorset, Somerset and Devon (Jukes-Browne & Hill, 1903 : 113, Eggardon Hill ; Jukes-Browne & Hill, 1904 : 473). Cenomanian of Reigate (Davis, 1923 : 132). These records probably refer to *Bathrotomaria dixoni* sp. nov. (p. 404).

greppini Pictet & Campiche. Record : Albian (" Gaize ") of Devizes, Wiltshire (E. T. Newton, 1878 : 61 ; Jukes-Browne & Hill, 1900 : 256, 463). The species was founded on the internal mould of a *Conotomaria* from the Middle Neocomian. The record from Devizes probably refers to a form known only as an internal mould and not described in the present paper.

guerangeri d'Orbigny. Record : Cenomanian of Lewes, Sussex (Jukes-Browne & Hill, 1904 : 473). This record may refer to *Bathrotomaria linearis* (Mantell).

laharpi Pictet & Campiche. Record : Cambridge Greensand (Jukes-Browne, 1875 : 308, and subsequent works). See " *Pleurotomaria* B " of the present paper (p. 415).

lima d'Orbigny. Record: Cambridge Greensand (Jukes-Browne, 1875 : 308). See " *Pleurotomaria* F " of the present paper (p. 417).

matheroniana d'Orbigny. Record: Cenomanian (Chloritic Marl) of Devizes and Maiden Bradley, Wiltshire (Jukes-Browne & Hill, 1904 : 473). The record probably refers to *Conotomaria chardstockensis* sp. nov. (p. 411).

moreausiana d'Orbigny. Records: Cenomanian (Chloritic Marl) of Isle of Wight (Bristow, 1889 : 278 ; Jukes-Browne & Hill, 1904 : 473). The records probably refer to *Pleurotomaria rockenensis* sp. nov. (p. 395).

neocomiensis d'Orbigny. Records: Cambridge Greensand (Seeley, 1861 : 294) ; see " *Pleurotomaria* C " of the present paper (p. 416). Atherfield Clay of Pease Marsh and Shalford, near Guildford (Topley, 1875 : 421) ; no specimens of Pleurotomariidae from this formation have been seen by the present writer.

regina Pictet & Roux. Record: Cambridge Greensand (Jukes-Browne, 1877 : 499, and subsequent works). Specimens in the Sedgwick Museum said to be the basis of this record belong to *P. allobrogensis* Pictet & Roux. The original figures of *P. regina* published by Pictet & Roux (1849, pl. 24, figs. *2a–g*) seem to represent two different species. Figs. *2a–d* represent a specimen which retains its shell and is quite unlike any form found in the Cambridge Greensand.

rhodani (Brongniart). Records: Upper Greensand of Eastbourne, Sussex, and Petersfield and Alton, Hampshire (Topley, 1875 : 430). Upper Greensand, Devizes (Newton, 1878 : 61). Warminster Greensand (Jukes-Browne & Hill, 1900 : 463). Chloritic Marl, Isle of Wight (Bristow, 1889 : 278). Cambridge Greensand (Jukes-Browne, 1875 : 294, 308, and later works). For the Cambridge Greensand form, see " *Pleurotomaria* E " (p. 416). No suggestion can be made as to the species to which the other records refer.

rouxi d'Orbigny. Records: Cambridge Greensand (Jukes-Browne, 1875 : 294, 308, and later works). Chloritic Marl, Devizes, Wiltshire (Newton, 1878 : 75). For the Cambridge Greensand form, see " *Pleurotomaria* D " (p. 416). I cannot suggest to what species the other record refers.

vraconnensis Pictet & Campiche. Record: Cambridge Greensand (Jukes-Browne, 1875 : 293, 308, and later works). See " *Pleurotomaria* C " of the present paper (p. 416).

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PLATE 44

Pleurotomaria spilsbyensis sp. nov.

Holotype (B.M., G.4531). Neocomian, Berriasian, Spilsby Sandstone; Lincolnshire. Apertural and apical views (× 1). Page 413.

PLATE 45

Pleurotomaria spilsbyensis sp. nov.

FIG. 1. Paratype (S.M., B.11696). Neocomian, Berriasian, Spilsby Sandstone; Donnington, Lincolnshire. Base (× 1). Page 413.

Bathrotomaria swinnertoni sp. nov.

FIGS. 2*a*, *b*. Holotype (B.M., G89485). Neocomian, Hauterivian, Claxby Ironstone; Nettleton Top Mine, Lincolnshire. (*a*) Apertural view (× 1); (*b*) abapertural view (× 2·7). Page 401.

Bathrotomaria swinnertoni sp. nov.

FIG. 3. Paratype (B.M., G.89486). Neocomian, Hauterivian, Claxby Ironstone; Nettleton Top Mine, Lincolnshire. Part of last whorl, viewed in direction normal to slope of side of shell (× 4).

Bathrotomaria wrighti sp. nov.

FIGS. 4*a–d*. Holotype (B.M., G.89484). Neocomian, Hauterivian, Claxby Ironstone; Nettleton Top Mine, Lincolnshire. (*a*, *b*, *c*) Apertural, basal and apical views (× 1); (*d*) part of last whorl, viewed in direction normal to slope of side of shell (× 2). Page 400.

Bathrotomaria speetonensis sp. nov.

FIG. 5. Holotype (B.M., G55232). Neocomian, Hauterivian, Bed C4 of Speeton Clay; Speeton, Yorkshire. Apertural view (× 1); the specimen lacks most of the spire. Page 402.

Bathrotomaria speetonensis sp. nov.

FIGS. 6*a*, *b*. Paratype (G.S.M., 96773). Neocomian, Speeton Clay; Speeton, Yorkshire. Side and upper surface of last whorl (× 1·5); the rest of the specimen is missing.


1
2
a
b
3
4a
4
b
c
d
5
6
a
b

PLATE 46

Bathrotomaria nettletonensis sp. nov.

FIGS. 1*a–c*. Holotype (B.M., G.89487). Neocomian, Hauterivian, Lower Tealby Clay; Nettleton Top Mine, Lincolnshire. (*a*, *b*) Apertural and abapertural views (×1); (*c*) part of last whorl, viewed in direction normal to slope of side of shell (×2). Page 401.

Bathrotomaria atherfieldensis sp. nov.

FIGS. 2*a*, *b*. Holotype (B.M., G.432). Lower Aptian, top of Atherfield Clay, Lower Lobster Bed; Atherfield, Isle of Wight. (*a*) Abapertural view (×1); (*b*) part of last whorl, viewed in direction normal to slope of side of shell (×2·6). Page 402.

Leptomaria donningtonensis sp. nov.

FIG. 3. Holotype (S.M., B.11676). Neocomian, Hauterivian, Tealby Limestone; Donnington, Lincolnshire. Abapertural view (×1). Page 396.

Leptomaria donningtonensis sp. nov.

FIG. 4. Paratype (S.M., B.11677). Neocomian, Hauterivian, Tealby Limestone; North Willingham, Lincolnshire. Side of shell, viewed in direction normal to its slope (×3); the specimen is partly crushed.

Pleurotomaria toulmini sp. nov.

FIG. 5. Squeeze made from holotype (B.M., G.89481), a natural mould of the exterior of the shell. Aptian, Hythe Beds; probably Kent (×1). Page 392.

Bathrotomaria ferruginea (Keeping)

FIG. 6. Topotype (B.M., 66365). Lower Aptian; Potton, Bedfordshire (×1). Page 402.

Leptomaria willinghamensis sp. nov.

FIGS. 7*a*, *b*. Holotype (S.M., B.11675). Neocomian, Hauterivian, Tealby Limestone; North Willingham, Lincolnshire. (*a*) Apertural view (×1); an oyster adheres to side of shell; (*b*) side of shell, viewed in direction normal to its slope (×2). Page 396.

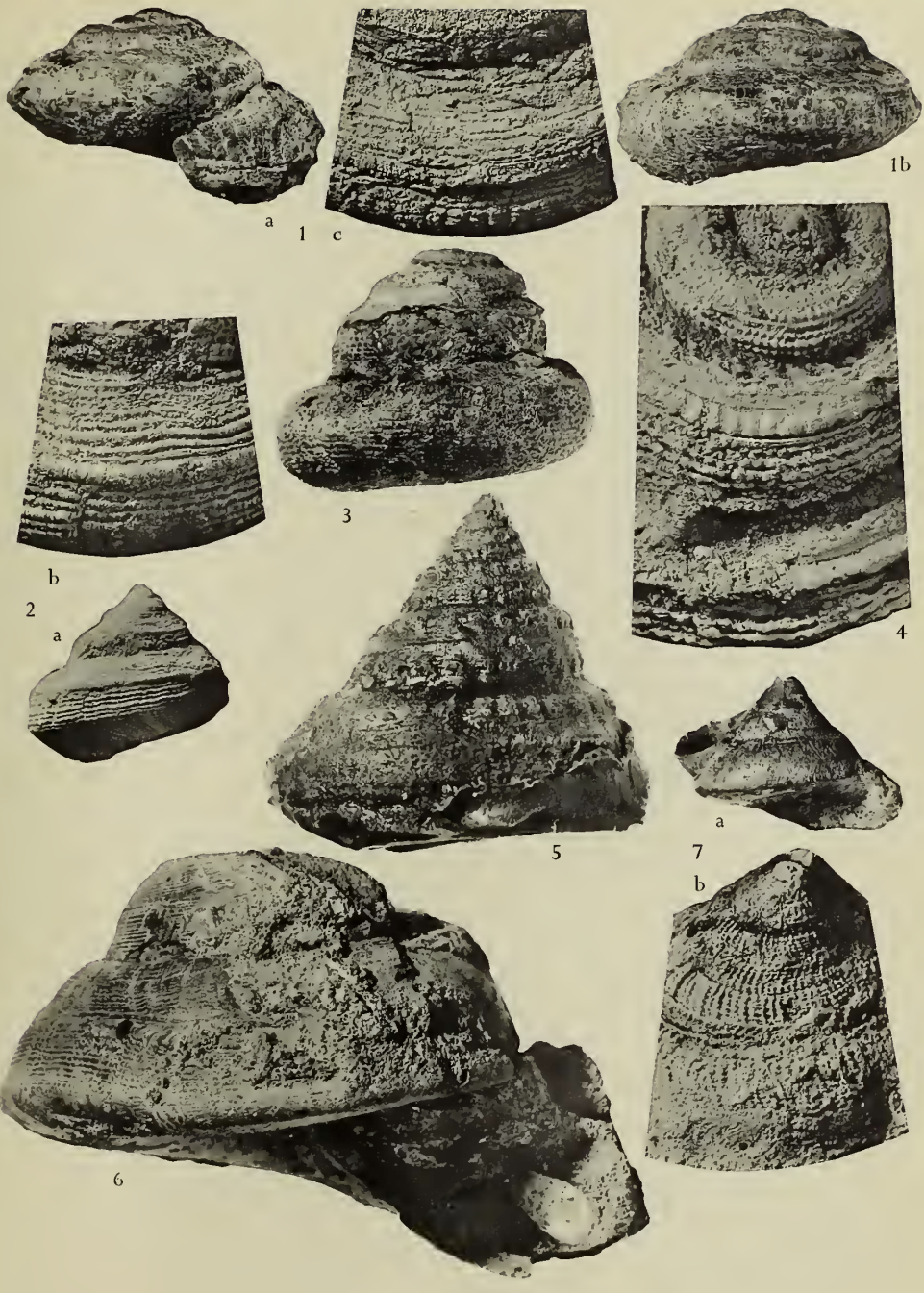

a
1
c
1b
3
b
2
a
4
5
a
7
b
6

PLATE 47

Pleurotomaria anstedi Forbes

FIGS. 1*a–d*. (B.M., G.72334.) Aptian, Sandgate Beds, *Parahoplites nutfieldensis* Zone; Park Pit, north of Nutfield Priory, Surrey. (*a*, *b*, *c*) Abapertural, apertural and basal views (×1); (*d*) part of side of shell, viewed in direction normal to its slope (×1·4). Page 413.

Conotomaria seendensis sp. nov.

FIGS. 2*a–d*. Holotype (G.S.M., 44656). Upper Aptian, *Parahoplites nutfieldensis* Zone; Seend, Wiltshire. (*a*) Apertural view (×1); (*b*, *c*) abapertural and basal views (×1·5); (*d*) part of penultimate and last whorls, viewed in direction normal to slope of side of shell (×4); the penultimate whorl retains traces of ornament on its lower half and of the selenizone at mid-height. Page 409.


a
1
1d
b
b
c
2
a
1c
1
2d

PLATE 48

Pleurotomaria campichei Keeping

FIGS. 1*a–c*. Holotype (S.M., B.19297). Aptian; Upware, near Cambridge. (*a*) Apertural view (×1); (*b*, *c*) basal and abapertural views (×1·5). Page 393.

Pleurotomaria campichei Keeping

FIG. 2. Topotype (G.S.M., 96771). Aptian; Upware, near Cambridge. Side of shell, viewed in a direction normal to its slope (×2·7).

Bathrotomaria leightonensis sp. nov.

FIGS. 3*a*, *b*. Paratype (B.M., G.89489). Lower Albian, *Leymeriella subregularis* Subzone; Arnold's Pit, Billington Crossing, near Leighton Buzzard, Bedfordshire. (*a*) Squeeze from natural mould, abapertural view (×1); (b) another squeeze from same natural mould, part of side of shell, viewed in a direction normal to its slope (×3·2). Page 403.

Bathrotomaria leightonensis sp. nov.

FIG. 4. Holotype (B.M., G.89488). Same occurrence as preceding specimen. Abapertural view (×1).

Conotomaria lamplughi sp. nov.

FIGS. 5*a–c*. Holotype (S.M., B.24567). Lower Albian, Shenley Limestone; Shenley Hill, Bedfordshire. (*a*) Apertural view (×1); (*b*) abapertural view (×1·5); (*c*) part of side of shell, viewed in a direction normal to its slope (×4·5). Page 410.

Pleurotomaria shenleyensis sp. nov.

FIGS. 6*a–d*. Holotype (S.M., B.24566). Lower Albian, Shenley Limestone; Shenley Hill, Bedfordshire. (*a*) Apertural view (×1); (*b*, *c*) abapertural and basal views (×1·5); (*d*) side of shell, viewed in a direction normal to its slope (×3). Page 393.

Leptomaria billingtonensis sp. nov.

FIGS. 7*a–d*. Holotype (B.M., G.65274). Lower Albian, *Leymeriella subregularis* Subzone; Arnold's Pit, Billington Crossing, near Leighton Buzzard, Bedfordshire. (*a*, *b*, *c*) Abapertural, apertural and basal views (×1); (*d*) part of side of last whorl, viewed in a direction normal to its slope (×3·5). Page 397.


a
b 1
c
2
b
3
a
c 5
a
5b
4
7d
b
6 d
c
c
6a
a 7 b

PLATE 49

Leptomaria gibsi (J. Sowerby)

FIG. 1. (B.M., G.55140.) Lower Middle Albian, *Douvilleiceras mammillatum* Zone; Gatehouse Pit, Grovebury, Leighton Buzzard, Bedfordshire. Squeeze from natural mould of exterior of shell (×2·5). Page 397.

Leptomaria gibsi (J. Sowerby)

FIGS. 2*a*, *b*. Holotype (B.M., 43630), a specimen lacking the outer shell-layer. Lower Middle Albian, *Douvilleiceras mammillatum* Zone, Lower Gault; Folkestone, Kent. (*a*) Apertural view (×1); (*b*) abapertural view (×1·5).

Leptomaria gibsi (J. Sowerby)

FIG. 3. Topotype (G.S.M., 98564). Same occurrence as the preceding specimen. Small portion of surface of shell, on which original ornament is preserved (×5); the suture crosses the middle of the figure.

Conotomaria folkestonensis sp. nov.

FIGS. 4*a*, *b*. Holotype (B.M., G.89482). Albian, Gault; Folkestone, Kent. (*a*) Apertural view (×1); (*b*) part of surface of two whorls, viewed in a direction normal to slope of side of shell (×2·5); the sutural ramp forms a light band near the top and, again, at the middle of the figure. Page 410.

Pleurotomaria plicata (J. Sowerby)

FIG. 5. Holotype (B.M., 43631). Albian, Gault; Folkestone, Kent. Internal mould, apertural view (×1). Page 394.

Pleurotomaria plicata (J. Sowerby)

FIGS. 6*a*, *b*. Topotype (B.M., G.4883). Upper Middle Albian, *Dipoloceras cristatum* Subzone, Gault; Folkestone, Kent. (*a*) Apical view (×1); (*b*) part of surface of two whorls, viewed in a direction normal to slope of side of shell (×2·8).

Pleurotomaria plicata (J. Sowerby)

FIGS. 7*a–c*. Topotype (B.M., G.89483). Same occurrence as preceding specimen. Apertural, basal and abapertural views (×1).

Leptomaria pricei sp. nov.

FIGS. 8*a–c*. Holotype (S.M., B.31837). Albian, Gault; Folkestone, Kent. (*a*, *b*) Apertural and abapertural views (×1); (c) part of side of shell, viewed in a direction normal to its slope (×2·9). Page 398.

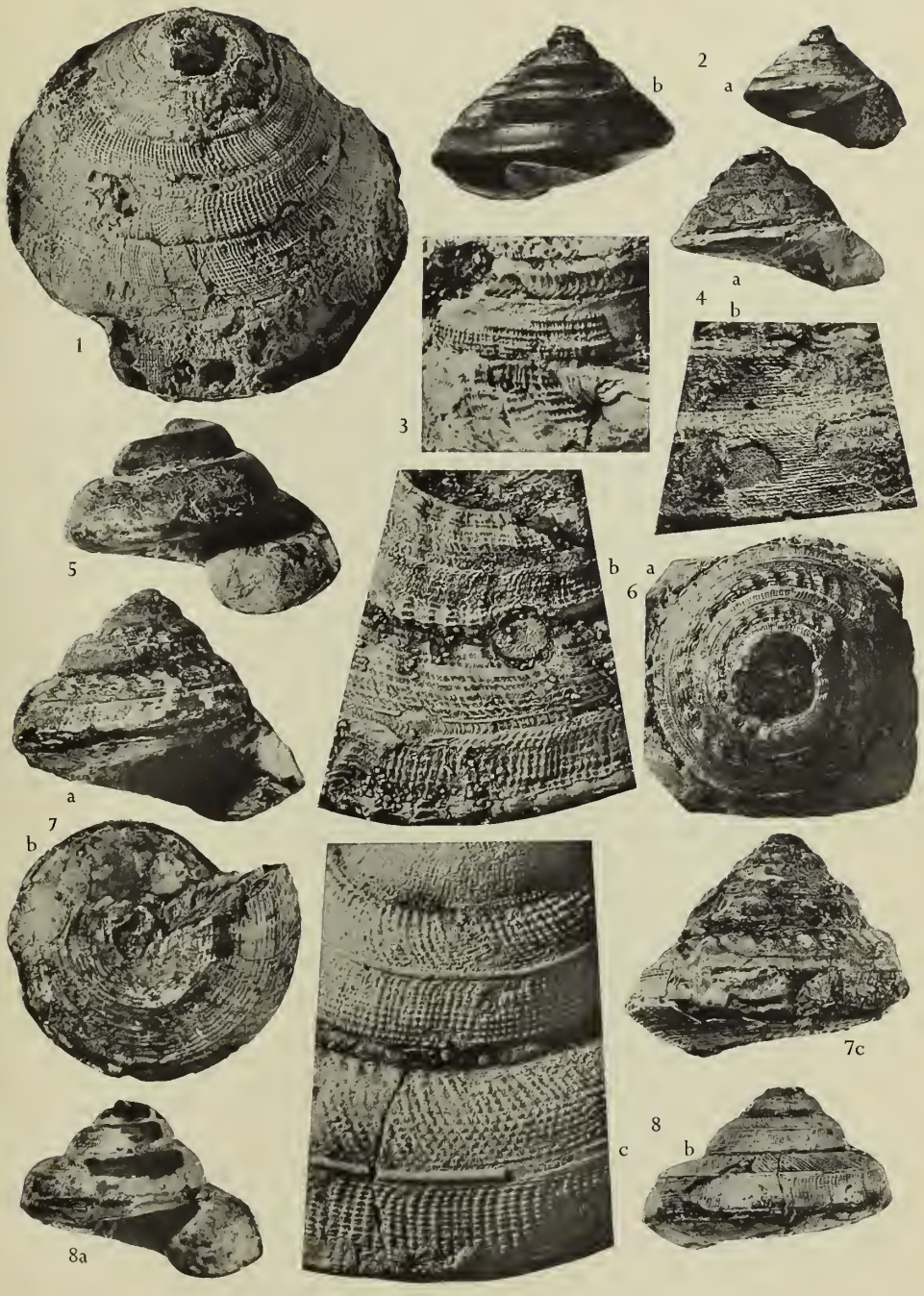

1
b
2
a
a
3
4
b
5
b
a
6
a
7
b
7c
8
b
c
8a

PLATE 50

Pleurotomaria allobrogensis Pictet & Roux

FIGS. 1*a*, *b*. (S.M., B.38734.) Upper Albian, Cambridge Greensand ; Cambridge district. Internal mould, apertural and apical views (× 1). Page 414.

Pleurotomaria D

FIG. 2. (B.M., G.8767.) Upper Albian, Cambridge Greensand ; Cambridge district. Internal mould, abapertural view (× 1). Page 416.

Pleurotomaria B

FIG. 3. (S.M., B.38881.) Upper Albian, Cambridge Greensand ; Cambridge district. Internal mould, apertural view (× 1). Page 415.

Pleurotomaria C

FIG. 4. (S.M., B.38745.) Upper Albian, Cambridge Greensand ; Cambridge district. Internal mould, abapertural view (× 1). Page 416.

Pleurotomaria F

FIG. 5. (B.M., G.82334.) Upper Albian, Cambridge Greensand ; Cambridge district. Internal mould, apertural view (× 1). Page 417.

Pleurotomaria E

FIG. 6. (S.M., B.38769.) Upper Albian, Cambridge Greensand ; Cambridge district. Internal mould, abapertural view (× 1). Page 416.

Pleurotomaria G

FIG. 7. (B.M., G.3419.) Upper Albian, Cambridge Greensand ; Cambridge district. Internal mould, abapertural view (× 1). Page 417.

Pleurotomaria vectensis sp. nov.

FIG. 8. (B.M., G.90870.) Lower Cenomanian, *Schloenbachia varians* Zone, Glauconitic Marl ; St. Lawrence, Isle of Wight. Internal mould, apertural view (× 1). Page 394.

Pleurotomaria vectensis sp. nov.

FIG. 9. (B.M., 88896.) Lower Cenomanian ; Warminster, Wiltshire. Internal mould, apertural view (× 1).

Pleurotomaria vectensis sp. nov.

FIGS. 10*a–c*. Holotype (B.M., G.3421). Lower Cenomanian, *Schloenbachia varians* Zone, Glauconitic Marl ; Sand Rock Spring, near Chale, Isle of Wight. (*a*) Apertural view (× 1) ; (*b*) base (× 1·5) ; (*c*) two whorls, viewed in a direction normal to slope of side of shell (× 2·6).

Conotomaria chardstockensis sp. nov.

FIG. 11. (B.M., 88898.) Cenomanian ; Devizes, Wiltshire. Internal mould, apertural view (× 1). Page 411.

Conotomaria chardstockensis sp. nov.

FIGS. 12*a–c*. Holotype (B.M., G.3422). Cenomanian ; Chardstock, Dorset. (*a*) Abapertural view (× 1) ; (*b*) base (× 1·3) ; (*c*) part of last two whorls, viewed in a direction normal to slope of side of shell (× 3) ; the suture is in the middle of the figure.

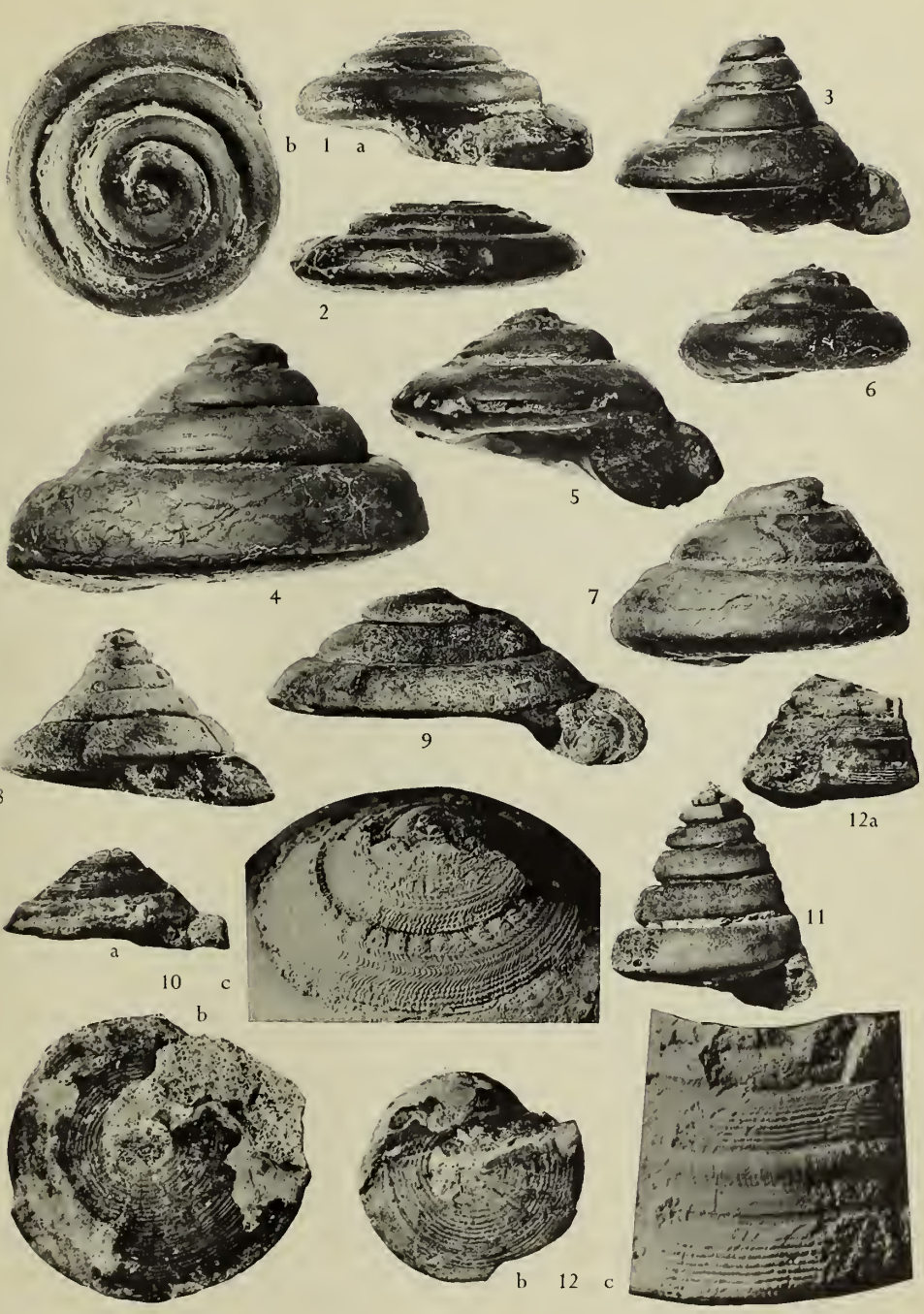

b 1 a
2
3
4
5
6
7
8
9
a
10 c
b
11
12a
b 12 c

PLATE 51

Leptomaria hindei sp. nov.

FIGS. 1*a–c*. Holotype (B.M., G.27577). Cenomanian Limestone ; probably of South Devon. (*a*, *b*) Abapertural and basal views (×1) ; (*c*) part of last whorl, viewed in a direction normal to slope of side of shell (×1·7). Page 400.

Pleurotomaria rockenensis sp. nov.

FIGS. 2*a–c*. Holotype (B.M., G.89490). Lower Cenomanian, *Schloenbachia varians* Zone. Glauconitic Marl ; Rocken End, Isle of Wight. (*a*) Apertural view (×1) ; (*b*) base (×1·4) ; (*c*) part of last whorl, viewed in a direction normal to slope of side of shell (×3). (Page 395).

Pleurotomaria rockenensis sp. nov.

FIG. 3. Paratype (S.M., B.62656). Lower Cenomanian, *Schloenbachia varians* Zone, Glauconitic Marl ; Ventnor, Isle of Wight. Apertural view (×1).

Pleurotomaria rockenensis sp. nov.

FIGS. 4*a*, *b*. Paratype (B.M., G.429). Lower Cenomanian, *Schloenbachia varians* Zone, Glauconitic Marl ; Isle of Wight. Internal mould, apertural and apical views (×1).

Leptomaria wilmingtonensis sp. nov.

FIG. 5. Paratype (B.M., G.89494). Cenomanian Limestone ; Wilmington, near Honiton, Devon. Side of shell, viewed in a direction almost normal to its slope (×2). Page 399.

Leptomaria wilmingtonensis sp. nov.

FIGS. 6*a*, *b*. Holotype (B.M., G.89495). Same occurrence as preceding specimen. Abapertural and basal views (×1).

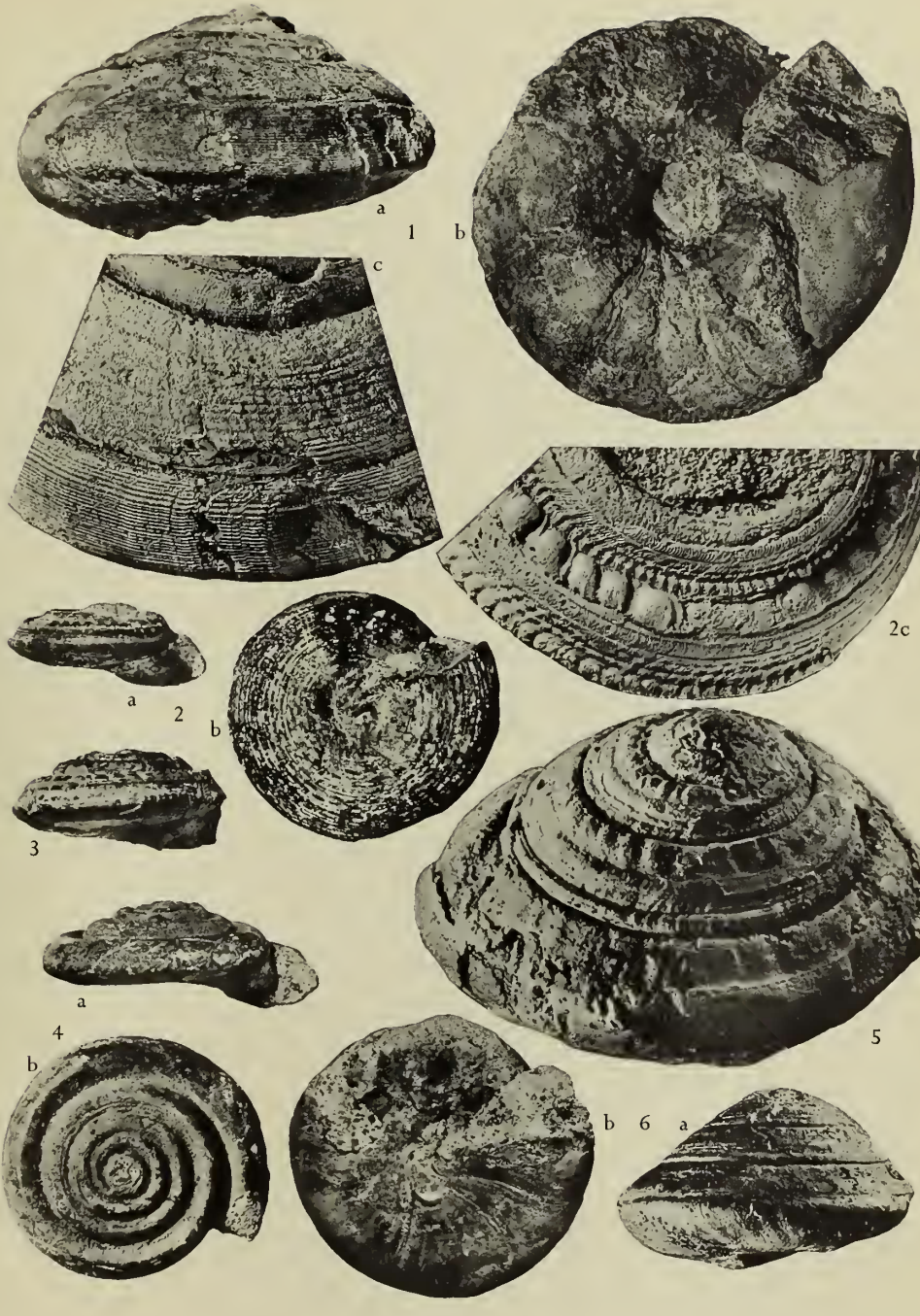

a
1
b
c
2c
a
2
b
3
a
4
b
b
6
a
5

PLATE 52

Conotomaria mailleana (d'Orbigny)

FIGS. 1*a–c*. (B.M., G.49915.) Cenomanian Limestone; 2 miles east of Seaton, Devon. (*a*, *b*) Apertural and basal views (×1); (*c*) part of side of shell, viewed in a direction normal to its slope (×2); the suture, which is rather obscure, is seen towards the top and, again, at the middle of the figure; the selenizone, which is more conspicuous, is seen at about one-third of the whorl-width below it. Page 412.

Conotomaria mailleana (d'Orbigny)

FIG. 2. (B.M., G.89506.) Cenomanian Basement Bed; Snowdon Hill, Chard, Somerset. Apertural view (×1); the specimen is almost an internal mould.

Pleurotomaria A

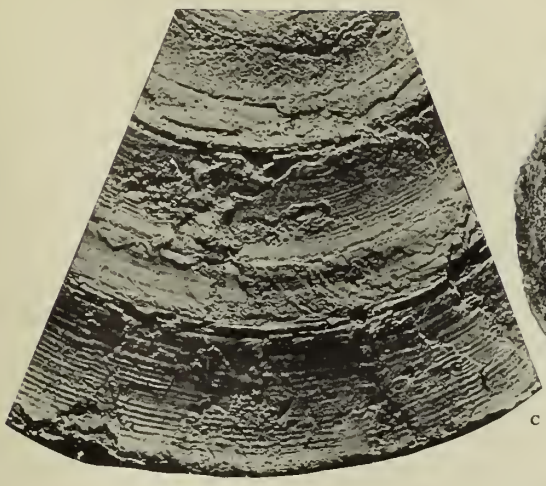
FIG. 3. (B.M., 32617.) Cenomanian; Warminster, Wiltshire. Internal mould, abapertural view (×1). Page 415.

Leptomaria axmouthensis sp. nov.

FIGS. 4*a*, *b*. Paratype (S.M., B.34826). Cenomanian Limestone; Axmouth, near Seaton, Devon. Apertural and basal views (×1). Page 399.

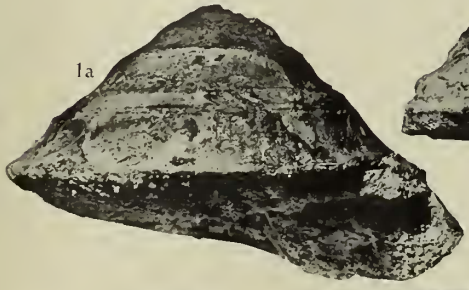
Leptomaria axmouthensis sp. nov.

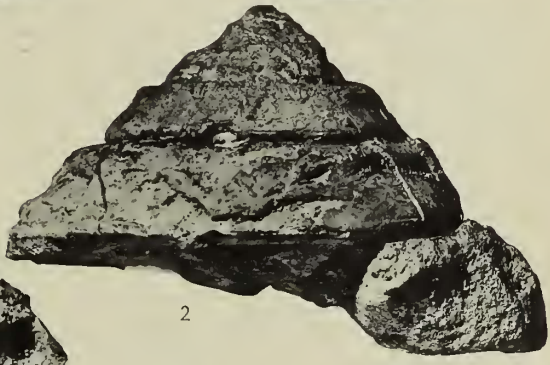
FIGS. 5*a*, *b*. Holotype (S.M., B.34824). Same occurrence as preceding specimen. (*a*) Abapertural view (×1); (*b*) part of side of shell, viewed in a direction normal to its slope (×3); rather more than three whorls are seen.



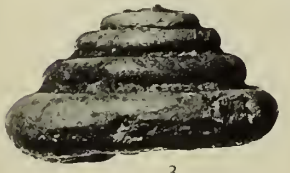
c 1 b

1a



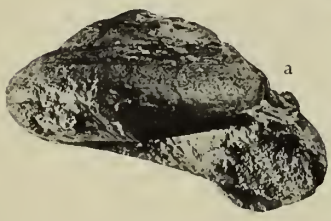


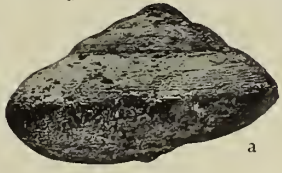
2

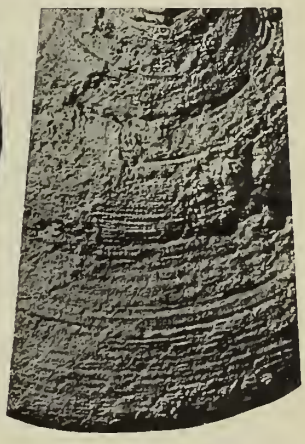


3

a 4 b







a 5 b

PLATE 53

Conotomaria laticarinata sp. nov.

FIGS. 1*a–c*. Holotype (B.M., G.89505). Cenomanian Limestone ; Whitlands, near Seaton, Devon. (*a*, *b*) Apertural and basal views (× 1) ; (*c*) part of penultimate whorl, viewed in a direction normal to slope of side of shell (× 2) ; the adapical suture is the narrow groove seen near the top of the figure, and the selenizone lies between the two conspicuous grooves below it ; the abapical suture coincides with the lower edge of the figure. Page 412.

Pleurotomaria glyndensis sp. nov.

FIGS. 2*a–c*. Holotype (B.M., 88804). Cenomanian, *Schloenbachia varians* Zone, Lower Chalk ; Glynde, Sussex. (*a*, *b*) Abapertural and basal views (× *c*. 1) ; (*c*) part of side of shell, viewed in a direction normal to its slope (× 3). Page 414.

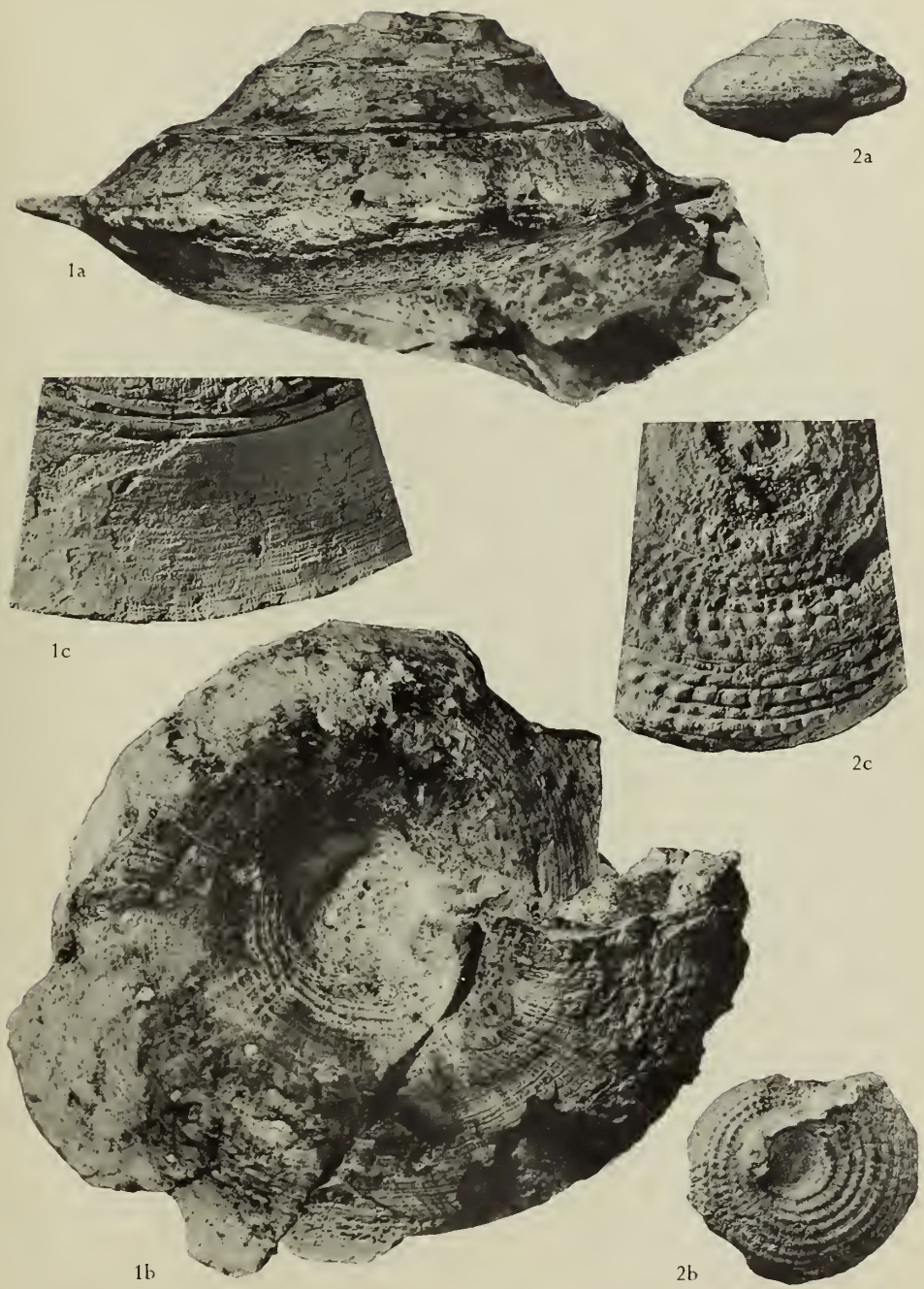

1a
2a
1c
2c
1b
2b

PLATE 54

Leptomaria seatonensis sp. nov.

FIGS. 1*a b*. Holotype (B.M., G.89493). Cenomanian Limestone; Havencliff, near Seaton, Devon. (*a*) Apertural view (×1); (*b*) side of shell, viewed in a direction normal to its slope (×2·3). Page 398.

Leptomaria seatonensis sp. nov.

FIG. 2. Paratype (B.M., G.49914). Cenomanian Limestone; 2 miles east of Seaton, Devon. Part of side of shell, viewed in a direction normal to its slope (×3).

Bathrotomaria velata (Goldfuss)

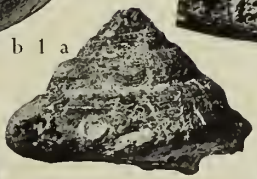
FIGS. 3*a–c*. (B.M., G.49923.) Cenomanian Limestone; Bindon landslip, east of Seaton, Devon. (*a*) Abapertural view (×1); (*b*) base (×1·5); (*c*) part of side of shell, viewed in a direction normal to its slope (×3); the suture is barely distinguishable, the position of its lowest appearance lying just above the middle of the figure. Page 405.

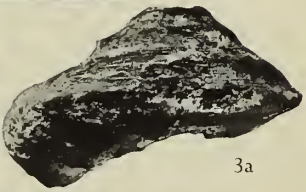
Bathrotomaria velata (Goldfuss)

FIG. 4. (S.M., B.34804.) Cenomanian, Lower Chalk; Glynde, Sussex (×1·1).

b 1 a

2



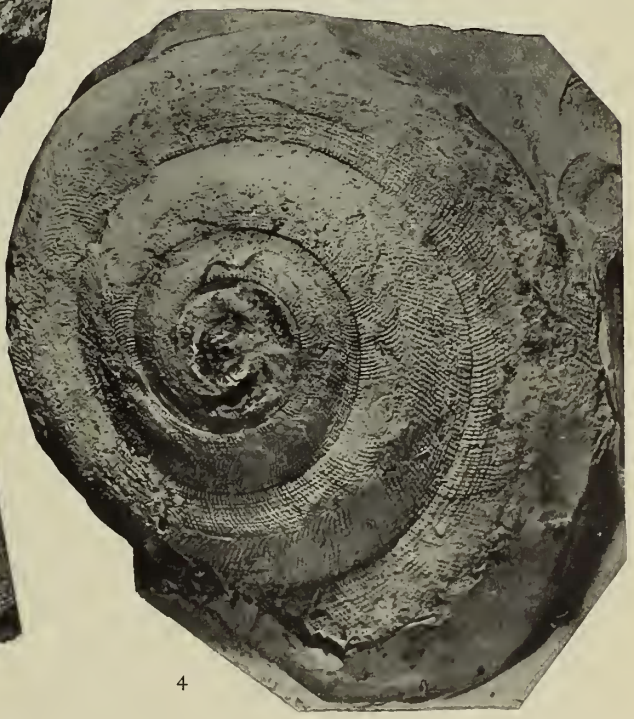


3a

b

3

c



4

PLATE 55

Bathrotomaria dixoni sp. nov.

FIGS. 1*a–c*. Holotype (B.M., G.49898). Cenomanian Limestone; near Culverhole, east of Seaton, Devon. (*a*, *b*) Apertural and abapertural views (×1); (*c*) side of shell, viewed in a direction normal to its slope (×3). Page 404.

Bathrotomaria dixoni sp. nov.

FIG. 2. Paratype (B.M., G.82347). Cenomanian, Lower Chalk; Dover. Apical view (×1); the specimen has been somewhat flattened by pressure.

Bathrotomaria linearis (Mantell)

FIGS. 3*a–c*. Lectotype (B.M., 8639). Cenomanian, *Schloenbachia varians* Zone, Lower Chalk; Hamsey, near Lewes, Sussex. (*a*, *b*) Apertural and apical views (×1·1); (*c*) part of side of shell, viewed in a direction normal to its slope (×2·3); the suture appears in a position slightly below the diamond-shaped scar towards the top of the figure and, again, meets the right-hand margin of the figure just below its middle. Page 403.

Bathrotomaria linearis (Mantell)

FIG. 4. (B.M., 88795.) Cenomanian, Lower Chalk; near Heytesbury, Wiltshire. Apical view (×1).

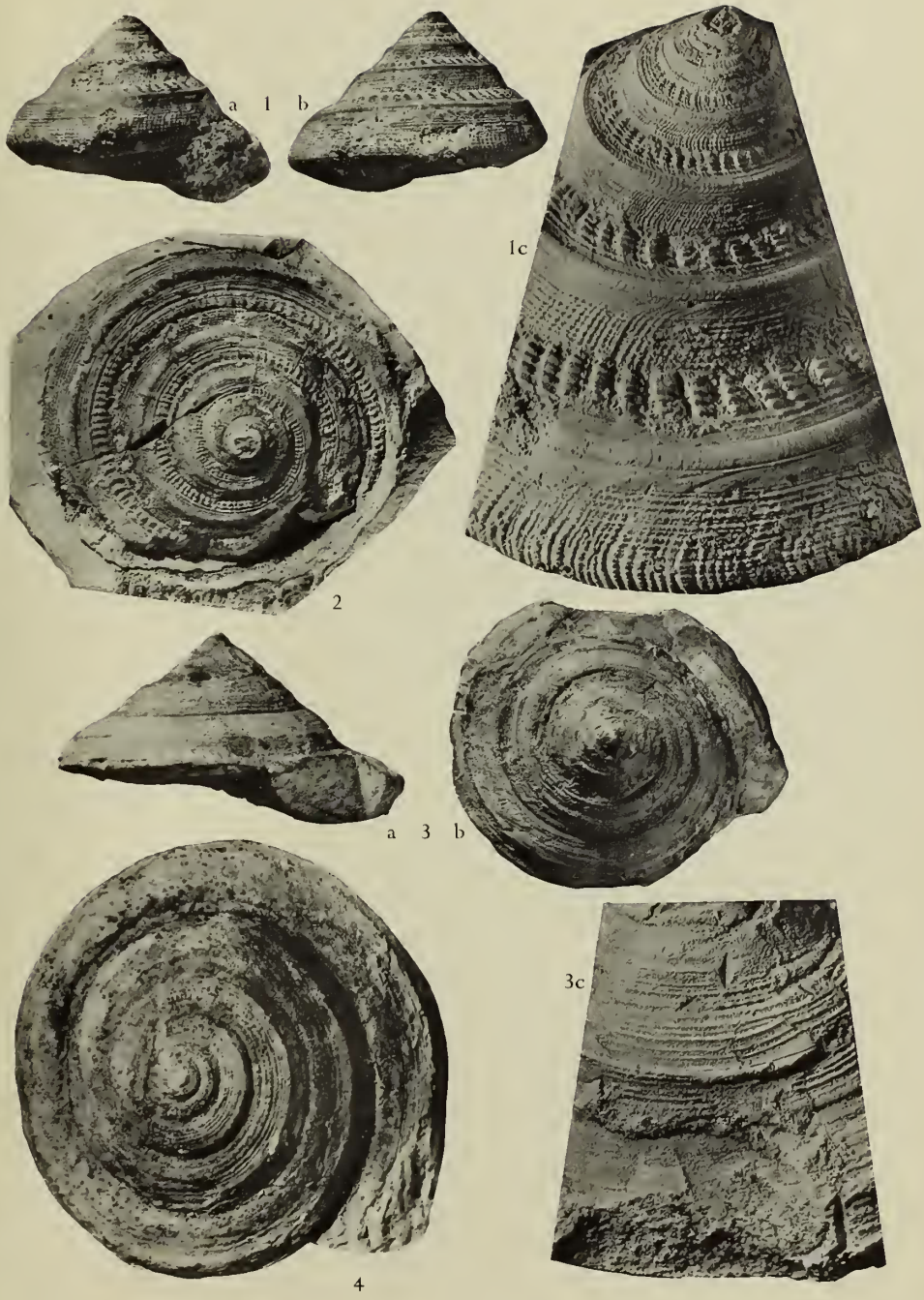
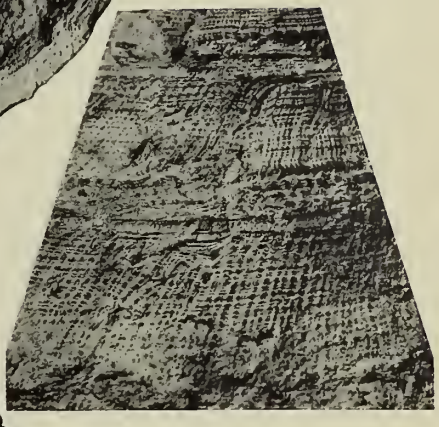

a 1 b
1c
2
a 3 b
3c
4

PLATE 56

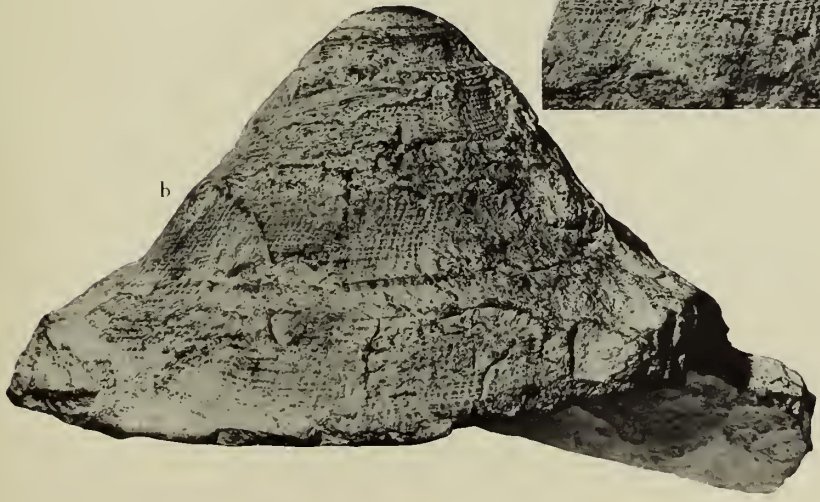
Bathrotomaria ashburneri sp. nov.

Holotype (B.M., G.78106). Cenomanian, *Schloenbachia varians* Zone, Lower Chalk ; Chinnor, Buckinghamshire. (*a*, *b*) Basal and apertural views (×1) ; (*c*) part of side of shell, viewed in a direction normal to its slope (×1·5) ; the suture appears near the top of the figure and, again, slightly above the middle. Page 405.

a



c



b

PLATE 57

Bathrotomaria regalis (Roemer)

FIGS. 1*a–c*. (B.M., G.8824.) Upper Cenomanian, *Holaster subglobosus* Zone, Gray Chalk; Folkestone, Kent. Abapertural, basal and apertural views (× 1). Page 408.

Conotomaria percevali sp. nov.

FIGS. 2*a*, *b*. Holotype (B.M., G.23029). Cenomanian Limestone; near Axmouth, Devon. Apertural and basal views (× 1). Page 411.

Bathrotomaria regalis (Roemer)

FIG. 3. (B.M., G.19058.) Upper Senonian, *Belemnitella mucronata* Zone; Magdalen Chapel, Norwich (× 1).


1
a
b
b
2
a
3
1c

PLATE 58

Bathrotomaria perspectiva (Mantell)

FIGS. 1*a–c*. (B.M., G.88794.) Turonian, *Holaster planus* Zone, Chalk Rock; Oldbury Hill, Wiltshire. Depressed specimen; (*a*, *b*) apertural and apical views (×1); (*c*) part of surface of two whorls (×2·5). Page 406.

Bathrotomaria perspectiva (Mantell)

FIG. 2. (B.M., G.29346.) Turonian, Middle Chalk; Cuxton, Kent.

Bathrotomaria perspectiva (Mantell)

FIGS. 3*a*, *b*. (S.M., B.4775.) Turonian, *Holaster planus* Zone, Chalk Rock; Cuckhamsley, Berkshire. (*a*) Apertural view (×1); (*b*) part of side of shell, viewed in a direction normal to its slope (×1·6).

b

1

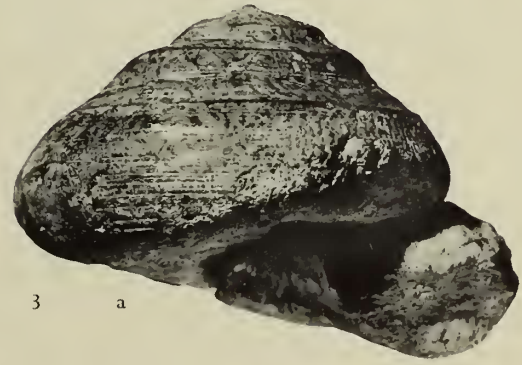
1c

a

2

b

3



a

PLATE 59

Bathrotomaria perspectiva (Mantell)

FIGS. 1*a–c*. (S.M., B.34801.) Lower Cenomanian, *Schloenbachia varians* Zone, Glauconitic Marl; Bridport, Dorset. Young specimen resembling holotype of *Cirrus granulatus* (Fig. 3) in size and ornament; (*a*, *b*) apertural and basal views (×1); (*c*) shell viewed in a direction normal to the slope of its nearer side (×3). Page 406.

Bathrotomaria perspectiva (Mantell)

FIG. 2. (B.M., 98208.) Cenomanian, Lower Chalk; southern England. Specimen in which the type of ornament seen in the holotype of *Cirrus granulatus* (Fig. 3) persists to late growth stages (×1).

Bathrotomaria perspectiva (Mantell)

FIG. 3. Holotype of *Cirrus granulatus* Mantell (B.M., G.60538). Turonian ?, Middle ? Chalk; near Lewes, Sussex. Apical view (×1); the specimen is partly crushed.

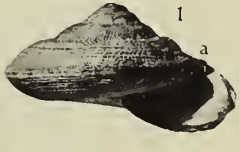
2

1c

b

1

a



3

PLATE 60

Pleurotomaria [*Conotomaria?*] I

FIGS. 1*a*, *b*. (B.M., G.69750.) Senonian, *Micraster cortestudinarium* Zone; Lower, Kent. (*a*) Internal mould, side view (× 1); (*b*) attachment area of oyster shell which adhered to the gastropod and reproduces its surface ornament of spiral cords (× 1); the selenizone is best seen near the top left-hand corner. Page 418.

Bathrotomaria perspectiva (Mantell)

FIG. 2. (B.M., G.23040.) Turonian, *Holaster planus* Zone, Chalk Rock; near Aston Rowant, Oxfordshire. Abapertural view (× 1). Page 406.

Pleurotomaria [*Conotomaria ?*] H

FIG. 3. (B.M., G.16517.) Cenomanian; Newington, near Folkestone, Kent. Internal mould, apertural view (× 1). Page 418.

b 1 a

2

3